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CITY COUNTY STATE

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"MUNICIPAL JOURNAL & PUBLIC WORKS" and "CONTRACTING"

DRIVING P. R. R. TUNNEL UNDER THE HUDSON RIVER.

Bottom middle door of shield open and continuous "sausage" of stiff silt entering, forced in by pressure of shield against face of silt.

IN THIS ISSUE:

Water Purification in Flint, Mich.
Tunneling in Hudson River Silt
Labor Notes
Sewage Sprinkler Nozzles
National Highway Policy
Well Pumping in Savannah

NEW YORK, MAY 1, 1920

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PUBLIC WORKS.

CITY COUNTY STATE

A Combination of "MUNICIPAL JOURNAL AND PUBLIC WORKS" and "CONTRACTING"

Vol. 48 NEW YORK, MAY 1, 1920 No. 16

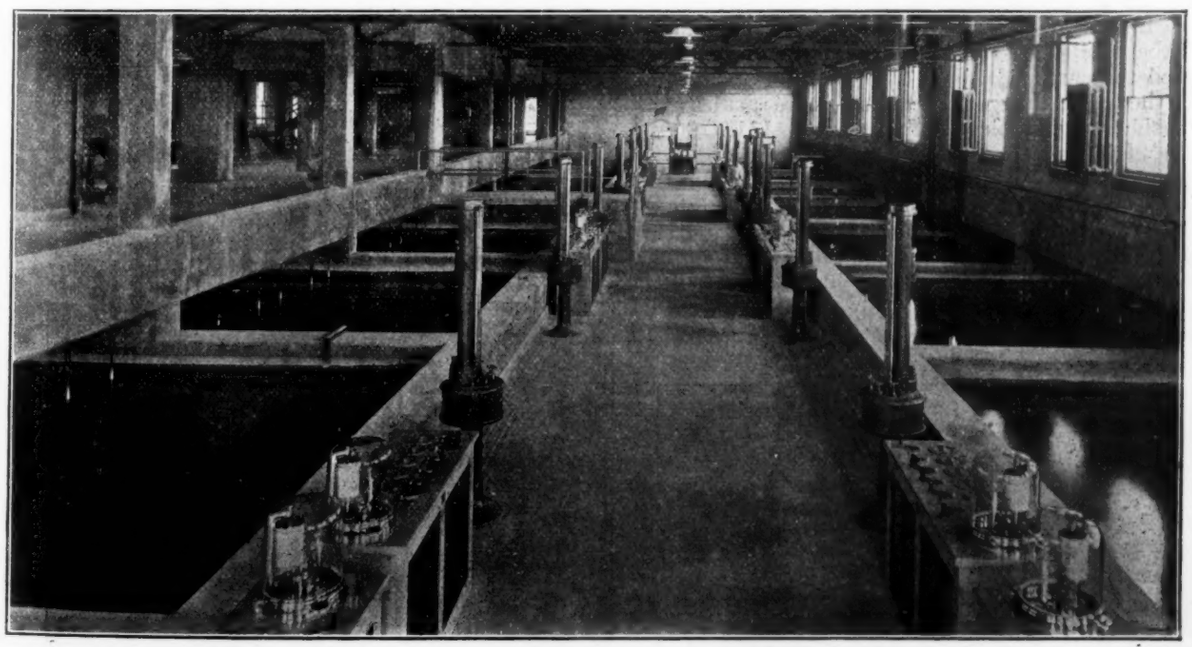
Water Purification in Flint, Mich.

The old filtration plant was doubled in capacity to provide for a similar increase in population since 1910; dry feed of chemicals was substituted for solution feed; softening was provided for, and other extensions and improvements made. At the same time the old pumps were replaced by larger and more efficient ones.

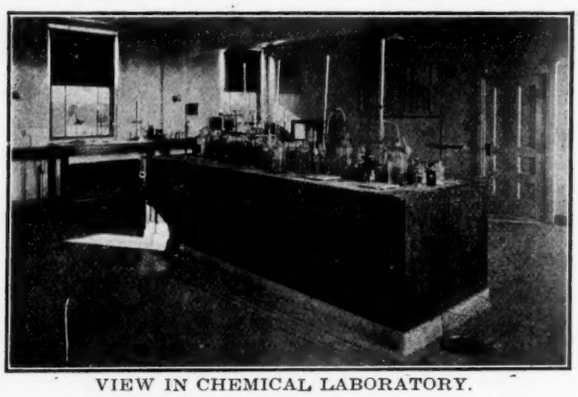
Last year, the municipal water works of Flint, Mich., began the use of a greatly enlarged purification plant and one believed to be up-to-date in every respect. At the same time it had greatly increased its pumping plant and made other improvements as part of a program begun in 1910 with the report of a joint committee on water supply. The service became municipal in 1903, when the plant of a private company was purchased by the city.

The city has a population of about 50,000, having increased about sixty per cent. since 1910, when the population was about 38,500, while in 1900 the population was only about 13,000. The supply is taken from the Flint river at a pumping station about a mile above the center of the city. The drainage area above the city is approximately 1,500 square miles.

In 1910 most of the pumping was done with a Laidlaw-Dunn-Gordon pump of 7 million gallons capacity, with a 4 million Holly and 1½ million Holly-Gaskill in reserve. In 1912 the Board of Water Commissioners built a new pumping station and filtration plant after plans developed by W. G. Clark of Toledo, Ohio. The pumping plant installed in the new station comprised a new Snow 12,000,000-gallon crank and fly-wheel pumping



MAIN OPERATING FLOOR OF FLINT FILTRATION PLANT.
Shows loss-of-head gauges, operating tables, controlers, etc. Looking north into pump room.



VIEW IN CHEMICAL LABORATORY.

engine, and the old Laidlaw-Duna-Gordon 7,000,000-gallon and Holly 4,000,000 were continued in service. There were also installed three 6,000,000-gallon DeLaval turbine-driven, geared, low-head pumps. The filtration plant was a rapid sand filter of 10,000,000 gallon capacity installed by the Pittsburgh Filter Manufacturing Company in accordance with the general practice and usage of that time, the chemical agents being dissolved and mixed in large tanks and added to the water through orifice boxes in the usual way. At the same time the distribution system was greatly strengthened and extended.

In 1916 it was decided to double the capacity of the filtration plant and add to it an equipment for softening the water. The capacity to be provided for ultimately was decided upon as 36,000,000 gallons per day, although the present capacity is only 16,000,000 gallons, which, however, is nearly double the capacity of the plant built in 1912. Although the contract was entered into in 1916, owing to delay in the excavation (which was under a separate contract) the actual work was not started until late in the summer of 1917. Difficulties of labor and of other kinds delayed the completion until the spring of 1919, and incidentally greatly increased the cost.

At the same time arrangements were made for increasing the pumping equipment. A 15,000,000-gallon high-lift pump was installed and has just been placed in service, and the old 7,000,000-gallon pump will soon be replaced with another 15,000,000 gallon unit. There is contemplated a 20,000,000-gallon high-lift turbine centrifugal and a 30,000,00 gallon low-lift centrifugal.

CONSTRUCTING NEW FILTRATION PLANT.

There were a number of very difficult engineering problems to be worked out in making the addition to the purification plant without interfering with the operation of the old plant in furnishing filtered water to the consumers. The new construction consisted of building two new settling basins of approximately 2¼ million gallons capacity, a baffled mixing chamber, eight additional filter units of one million gallons each, a new head house and chemical storage building, new laboratory, chemical feeding devices, intake and suction well. The entire cost of the work was in the neighborhood of $350,000.

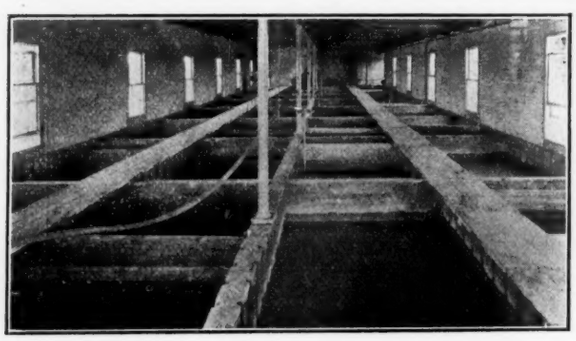
While constructing the new plant, it was necessary to operate for a considerable period with only one basin, owing to the fact that columns supporting the building and storage bins were constructed in the second basin, and in the end of this basin was constructed a portion of the conduit carrying water from the inlet well to the new mixing chamber. When the new chemical equipment, settling basins and clear-water well had been practically completed, the old mixing chamber was put out of commission and reconstructed to form the completed conduit to the new mixing chamber.

The supply conduit between the new and the old filters was then connected. This necessitated closing down the plant for a few hours to permit of building bulkheads, so that this work could be done and time provided for the setting of the concrete in the work. After the concrete had set, another short intermission of operation was required for the removal of the bulkheads, after which the water was turned into the new mixing chamber, basins and filters.

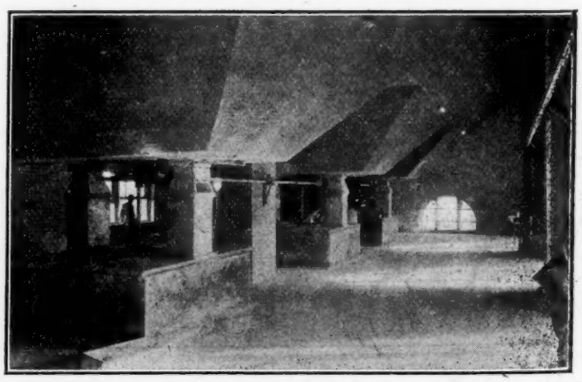
In order to connect the new clear water basin to the old ones, a float was built in the old clear-water well and a tight bulkhead provided with packing and a pipe connection to the inside. This bulkhead was sunk against the wall of the basin at the point of opening and the water withdrawn from the space between it and the wall. The pressure of the water in the basin kept it in place and the opening was cut through the wall from the opposite side, after which the bulkhead was removed and the connection completed without interference.

SUCTION PIPE AND WELL.

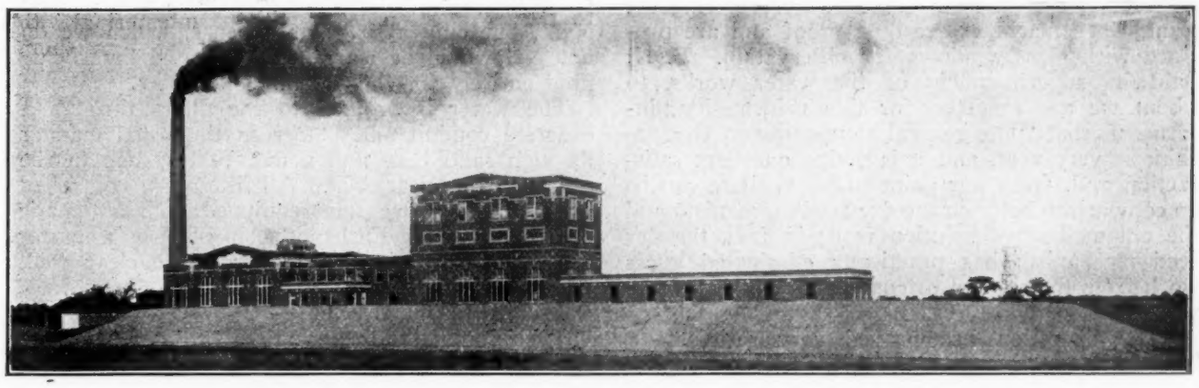
The original plant had been connected to the river with a 3½-foot brick conduit about 500 feet long connected directly to the suction of the low-lift pumps. This conduit had been slowly filling



MIXING CHAMBER AND BAFFLING SECTION.



SECOND FLOOR OF HEAD HOUSE.
Showing bottoms of chemical storage bins. Daily hoppers are directly underneath.



FRONT VIEW OF PUMPING STATION AND FILTER PLANT.
Raised portion of ground covers sedimentation basin.

with sand, and to provide for cleaning it, it was decided to install a second intake and connect both to a concrete suction well immediately adjoining the pumping station. The second conduit is 48 inches in diameter, circular section, of reinforced concrete. The suction well is rectangular, about 10 feet by 40 feet, and extends about 4 feet below the outside wall of the station, which necessitated a new foundation wall for the station, which wall was built in sections. The suction well is divided into two sections and so arranged that either conduit may be thrown out of commission.

The well was built around the old conduit, and after its completion the section containing this conduit was cut off from the other. That part of the conduit passing through the well was then removed and a sluice gate fitted to the end where it entered the well.

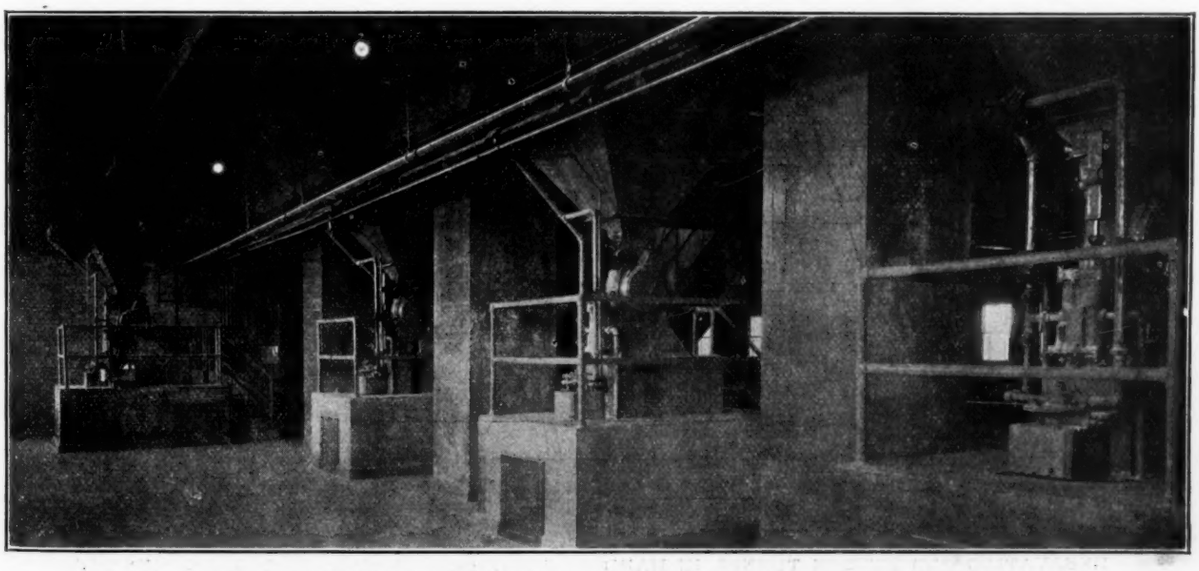
The contract for the entire work, as well as for the equipment, was given to the Pittsburgh Filter and Engineering Company and the work was done under the general supervision of F. N. Baldwin, the superintendent and manager of the Flint Water Department.

THE PURIFICATION PLANT.

In designing the new plant, an effort was made to install all of the approved modern features of such plants, among these the dry feed of chemicals. It is believed that this plant is the first to be designed and completed for the use of dry chemicals, although twenty-five or thirty other plants are now using dry chemical feed, but as this was provided for by means of changes in the original plans they are not arranged for the best economy.

For storing the chemicals there are eight reinforced concrete hopper-bottom bins which provide storage for approximately 600 tons. The materials are unloaded from the cars directly into storage battery trucks which operate over a concrete runway to hydraulic elevator cars, which raise the trucks to the charging floor, where the material is discharged directly into the storage bins. All the bins are connected directly to daily hoppers which are provided with chutes and slide gates. The bottom of each of these daily hoppers is connected to a dry feeding machine, of which there are three for handling hydrated lime (which is stored in six of the bins) and two for pulverized alum or iron sulphate receive a discharge from the other two bins.

The feeding machines will discharge any amount for which they are set between 100 pounds and 10,000 pounds a day and are operated automatically



MAIN FLOOR OF HEAD HOUSE, SHOWING DRY-FEED MACHINES.

in proportion to the amount of water entering the plant. The machines are dust proof and are provided with glass windows for observation. F. N. Baldwin, superintendent of the water works, to whom we are indebted for this information, informs us that "The general appearance of the machine is very neat, and it is giving excellent satisfaction and, from our point of view, there can be no comparison between the dry feed mechanism and the old method of solution feed; in fact, the dry feed mechanism has practically eliminated guess work from the amount of coagulant as added to the water.

"The operation has proved very satisfactory, both as to enabling us to get practically a complete removal of color, which we were unable to do with the old plant arrangement, and also enabling us to reduce the hardness from 230 p. p. m. to 110 p. p. m. It is possible to bring the water down to a neutral point, but only at a great expense, which we do not feel would be warranted, hydrated lime being used entirely for the softening purposes."

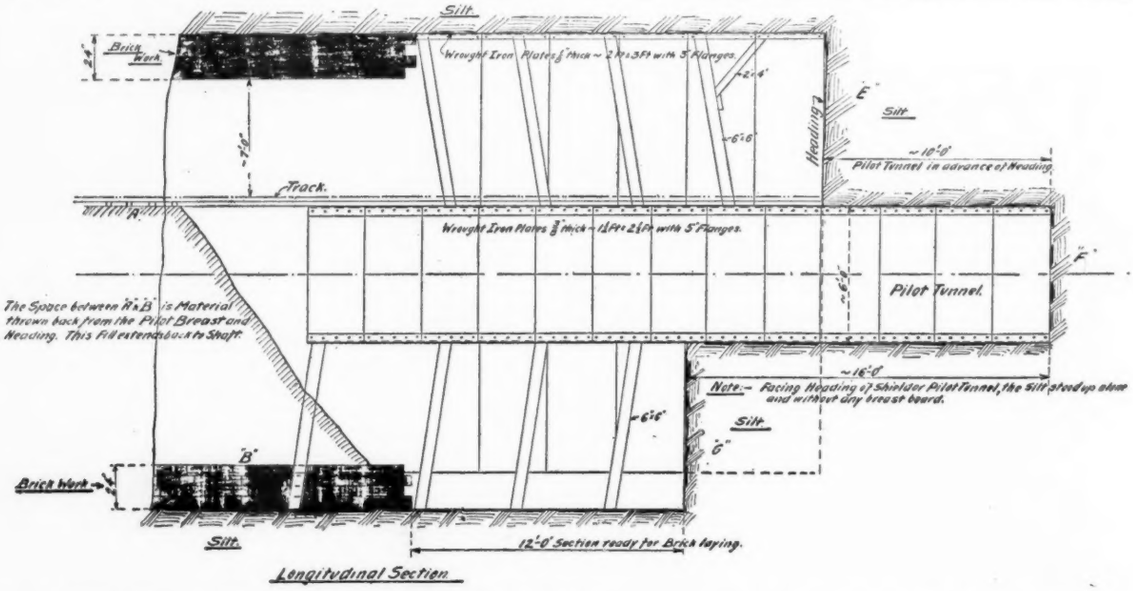
The water is brought to the filters through a concrete conduit and passes in the usual manner through sand beds and a manifold system in the filters to the clear well. All filters are controlled by hydraulic valves and equipped with automatic controllers of the Earl type, controlled by a master controller which is operated from the clear well, the level of the water in which is thus maintained at a pre-determined level.

The floor of the operating gallery, as well as the entire first floor and laboratory, are covered with mosaic tile and the entire interior of the building is painted with cream white enamel, giving a clean and sanitary appearance.

Tunneling in Silt

Thickness and tenacity of silt in the bed of the Hudson river demonstrated by its behavior and properties disclosed in excavating by tunnel methods. Notable absence of supposed unstable character disclosed when penetrated at a depth of only a few feet below the river bed. A plastic, tenacious mass of dense, thick material forced into the Pennsylvania Railroad tunnel in a continuous body that could be cut with a knife. Similar material in Hudson tube tunnel formed embankment with steep face, carrying constant traffic satisfactorily. Authoritative data of great importance to subaqueous excavation here published for the first time.

The Pennsylvania Railroad Company's single-track tunnels under the Hudson river, New York, were driven by the shield method through the silt at as high an elevation and as near the river bottom as was thought prudent. As the bottom here is of a sedimentary character with soft mud on top and is made of fine materials through which piles can be driven to a great depth, considerable anxiety as to its reliability and sustaining power was felt before the tunnels were built. It was even asserted that it would not afford stable support for the tunnels, that it had not sufficient strength


Silt
Brick Work
Wrought Iron Plates ⅝" thick ~ 2 Ft. 3 Ft. with 5" Flanges.
Heading
Silt
Pilot Tunnel in advance of Heading
Track.
Wrought Iron Plates ⅝" thick ~ 1 Ft. 2 Ft. with 5" Flanges.
Pilot Tunnel.
The Space between A & B is Material thrown back from the Pilot Breast and Heading. This Fill extends back to Shaft.
Note:— Facing Heading of Shield for Pilot Tunnel, the Silt stood up clear and without dry breast board.
Silt
Brick Work
Silt
12'-0" Section ready for Brick laying.
Longitudinal Section

EXCAVATING OLD HUDSON TUNNEL IN HARD SILT WITH SECTIONAL PILOT TUBE AND TOP AND BOTTOM SEMICIRCULAR HEADINGS.

to protect them during construction, to prevent their settlement afterwards, or to retain the compressed air used to balance the external pressure. Provisions therefore were made for openings in the lining of the tunnel invert to permit the sinking of foundation piles after the tunnel was in position, an operation that was eventually wholly discarded.

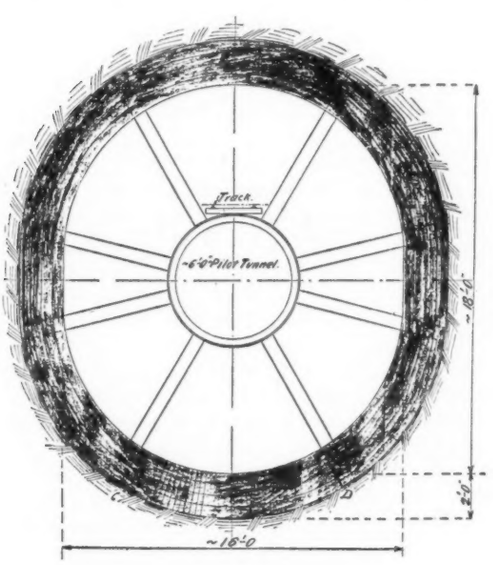
CHARACTER OF SILT

The tunnels were very successfully driven with shields and pneumatic pressure and the character of the soil encountered was not found to be especially difficult, even at points of maximum difficulty where the alignment passed from earth to rock. In general, the soil was firm and tough, apparently identical with the clay deposits on shore in the Hudson river valley and with the strata encountered in sinking the deep dredged foundations of the Poughkeepsie bridge and in deep clay pits excavated in cofferdams at Haverstraw.

At the tunnel elevation, a minimum of about 20 feet below the river bed, there was no indication of soft mud or soupy or flowing material, nor was there any action resembling quicksand or slumpy earth. The stiff, solid mud or clay encountered was dense enough to retain the air pressure well and stood up satisfactorily where exposed. The heavy pressure exerted by the powerful hydraulic jacks in the shields tended to squeeze moisture out of it, which, together with the waste of the water used in the jacks, produced a film of water around the shields tending to soften the surface of the clay in contact with it, but when exposed to the compressed air it soon dried.

DISPLACEMENT OF SILT BY SHIELD

Although it was a fine, dense clay, which could be penetrated by pressure, it was stiff and tough, and when the shield 23½ feet in diameter was forced ahead by an aggregate pressure of about 3,000 tons furnished by twenty hydraulic jacks, the soil was displaced upwards, permitting the shield to advance. The forward end of the shield could be entirely closed by heavy transverse vertical bulkheads in which doors could be opened at pleasure. No excavation was required in advance of the bulkhead and when the shield was "shoved," a 3x3-foot door in the bulkhead was opened, permitting a portion of the clay to enter and relieve the pressure in front. For each shove, the shield advanced 30 inches, at an average speed of about 1¼ inch per minute, while the material entered through the open door in a solid, continuous, compact mass at the rate of about 12 inches per minute, or about 10 times as fast as the shield advanced, a single continuous plug or sausage 20 or 25 feet long being forced into the tunnel with each shove, and thus offsetting perhaps a third of the volume displaced by the movement of the shield. After entering the shield, the sausage retained the marks made by forcing it through the door as through a die and presented sharp corners at the top and bottom of the vertical sides. It formed one smooth, unbroken mass until the rear end was forced off from the supporting platform and broke off or was cut, while the front end entering through the bulkhead was bent sharply downwards and showed distinct laminations, as are evident in the photograph shown on the front cover of this issue.



Cross Section.
Note:- There is no Plate between C & D, and Brick was laped on exposed Silt.

MOVABLE PILOT TUBE BRACED TO PERMANENT BRICK LINING.
Muck track above pilot tube.

CLAY BLANKET

It is the opinion of Major John F. O'Rouke, president and chief engineer of the O'Rouke Engineering Construction Company, contractor for this work, that this material prevails throughout the lower portion of the channel of the Hudson river and with proper treatment can be easily and safely tunneled through wherever a sufficient body of it exists above the tunnel roof, and that, where this is not the case, conditions can easily be made safe and satisfactory by simply increasing the thickness by the deposition of clay dumped in the river bed above to the required depth, displacing sideways the 50 feet of material, as was very successfully done in the construction of the six subway tunnels for the Public Service Commission across the East river, New York.

HUDSON TUBES TUNNELS

The tunnels under the Hudson river to Manhattan Island which now form a portion of the uptown line of the Hudson Tubes (sometimes called the McAdoo Tunnels) were commenced more than 30 years ago, when the use of compressed air for tunneling methods was comparatively novel and there were few engineers experienced in this class of construction. Great difficulty was experienced at first in building these tunnels under air pressure with open excavation closely followed up with a brick lining, which method left large, unprotected headings or faces, and resulted in serious blowouts and eventually caused a disastrous run-in near the shaft connection which cost many lives. Afterwards the tunnel was extended about 2,000 feet by the pilot method under the direction of Col. Haskin and finally was completed by the modern pneumatic shield method similar to that used for the construction of the Pennsylvania Railroad Company's tunnels a few miles farther up the river. The brick chamber for these shields was 23 feet in diameter.

PILOT METHOD OF DRIVING

The pilot method involved the use of a long sectional steel tube 6 feet in diameter driven in advance on the center line of the tunnel. This tube was made in rings 30 inches long, each composed of bent plates bolted together through inside flanges provided on all of their edges. The tube afforded preliminary protection and was subsequently used to shore the ⅛-inch segmental plates set against the clay in the roof and sides and thus prevent caving in of the full size tunnel excavation before the completion of its brick lining.

In driving the pilot tube, the miners excavated the earth face, making room for the addition of another ring, the segments for which were removed from the rear of the pilot tube and bolted on in front as the work progressed. The rear end of the pilot tube was always thoroughly braced by radial struts engaging the permanent tunnel lining and the outer ends of these strets were inclined backwards to give support and resist any possibile backward thrust in the tube.

The forward end of the pilot tube was always solidly embedded in the soil while excavation was made around the middle portion of the tube and carried out to the circumference of the finished tunnel, where the earth was retained by the lining of segmental steel plates similar to but lighter than those used for the pilot tube, which were intended to support the clay until the permanent brick lining 2 feet thick had been completed in the rear in lengths of 12 to 15 feet. The pilot tube was of such length that it always extended into the completed brick lining and was braced against it and directly against the permanent steel lining plates against which the brick work was laid.

The cross-section of the tunnel was not quite circular, the vertical diameter being 22 feet long and the horizontal one 20 feet long from out to out of brick work.

ENLARGING EXCAVATION IN DRY SILT

The tunnel was enlarged and the brick lining was laid in sections 12 feet long, in which operation the excavation around the pilot tube was made in top and bottom headings where the silt stood up as it did in front of the pilot tube without breast boards. Sometimes, however, a tendency to scale off caused the use of an occasional breast board in the bottom and top headings.

In starting a new ring at the top of the full size excavation, the silt at the top of the headings was excavated 2 feet forward of the last ring about 3 feet long and the top plates were put in place simultaneously with the erection of the side plates in the rear. The plates were flange-bolted together and were braced to the pilot tube, but they were not continued around the full circumference of the circle, the lower plates resting with their edges supported only on the earth. The invert of the full size tunnel excavation was thus left exposed without developing any tendency to rise or flow and was found stiff enough to support the workmen and receive the first course of brick lining.

The silt or clay encountered in the excavation was quite hard and was removed in solid lumps cut out with a square pointed shovel similar to a garden spade, but wider and sharper. The 12-foot section of tunnel was widened out to full diameter around the pilot tube by 25 men working 36 hours and the brick lining was laid up by six men in 24 hours, the finished tunnel being completed at the rate of about 5 linear feet per day.

The muck excavated from the faces in the headings E, F and G was stored on the finished brick invert, where it was piled up to a height of 14 feet and was stable at a steep slope at the forward end. The muck was so stiff and dry that the service tracks were laid directly on top of it and the men and mules traveled back and forth over it without difficulty.

OFFICIAL'S STATEMENT

P. Fitzgerald, assistant superintendent of the work, who made the sketches from which the accompanying diagram was prepared, states that, "About the year 1889 Pearson & Son took charge of the tunnel work. We excavated a large chamber at the advance heading in which we assembled a shield, which came from England. From that place on, cast iron plates were used. When the shields were ready to push forward, we found we had not sufficient power to do so and it was necessary to put men in the shield pockets to clean them out. About 1902, Mr. McAdoo took charge and operations continued until we struck rock, when it was found necessary to alter the front of the shield and we excavated a chamber extending 6 feet forward of the cutting edge. In making this excavation, I found the silt as hard as it was 2,500 feet further back, where the shield was first installed.

"In the excavation mentioned before and while the tunnel has been driven by the pilot method, there was no water in evidence as coming through the silt. Occasionally we had some bad rushes of water between tail end of shield and tunnel lining. This was remedied by dumping mud in the river over the shield."

SILT EXCAVATED WITH VERTICAL FACES OUTSIDE OF SHIELD

Referring to the Pennsylvania Railroad Company's tunnel from 34th Street (Manhattan) to Weehawken, on the construction of which he was employed, Mr. Fitzgerald said: "When the four shields driving the Pennsylvania Railroad tunnel arrived at the bulkhead line in both sides of the river, it was necessary to go in the front of the shield and cut off the bulkhead piles. In the Weehawken side, we excavated the breast from the top of shield to the bottom. The silt was about as stiff as in the McAdoo tunnel and stood up allright. We shoved the sliding platform against the breast as a precautionary measure. In the New York side, at the bulkhead, we found course rubble which extended some distance down from top of shield and under this was the silt the same as in Weehawken. The rubble was braced but the silt did not require such attention. After pulling the test piles which were screwed down through the bottom of the tunnel about the center point, we filled in the holes and closed the bottom plate. The clay was hard and there was no water in the cavaties exposed before filling them."

Hudson River Silt

In view of the difference of the opinions on the subject of the preceding article which are held by two men prominent in tunneling work, John F. O'Rourke, a tunnel contractor of wide experience, and Clifford M. Holland, chief engineer of the New York State and New Jersey Interstate Tunnel Commissions, we submitted to each of these a copy of the preceding article and the editorial on the subject which appears in this issue, and have received from them the following letters:

Editor Public Works; Dear Sir,

Referring to "Subaqueous Excavation for the Hudson River Tunnels," the objection raised therein to the difficulty of maintaining proper pressure in a shield of very large diameter does not apply to Hudson river silt but to sand and gravel which would be encountered in the approach section. In other words, the Hudson river silt is the one material in which differential air pressure gives no concern.

In the last paragraph of this article, you draw a conclusion which is in my opinion absolutely unwarranted in referring to the clay in Boston Harbor as being of a somewhat similar nature. They are not of a comparable nature for the Boston blue clay is a very stiff material, as stated, whereas the Hudson river silt is stiff only under the action of air pressure. In this connection you should bear in mind that Mr. Fitzgerald's statements are made in regard to a material which he has observed under compressed air conditions which those familiar with the effect of compressed air upon material of this character appreciate transforms its character, as the introduction of air drives the water out of the mass and eliminates the lubricant which causes it to flow.

In regard to the article "Tunneling in Silt," there is one point which should be clearly brought out, and that is that the Hudson river silt does materially differ from any other material in that it is possible to push the material aside without excavating. You can not possibly do this in a stiff blue clay such as is found in Boston nor can you do it in the quicksand in the East river.

In regard to the controversy as to the real character of the Hudson river silt, the statement of Mr. O'Rourke proves conclusively the very point which we contend, as follows:

Mr. O'Rourke states that the Hudson river silt under compressed air stands up very firm—so firm that you can cut the faces into successive steps. I believe that this statement is based on Mr. Fitzgerald's statements referring particularly to the work in the old Haskin tunnel. Mr. O'Rourke has further stated, with photographs as supporting data, that at the time of shoving the shield, the material comes in ten times as fast as the shield advances, which shows the abnormal stresses set up in the Hudson river silt by the pushing of the shield, excavating only part of the face.

Furthermore, this same condition is shown by the fact that if the shield is shoved, it is necessary to keep the hydraulic pressure on the jacks; otherwise, the material pushes the shield back to where it started. These statements prove conclusively that the material around the shield is under abnormal stress and upon the immediate passing of the shield, grips the tunnel, causing the shortening of the horizontal diameter, a phenomenon which has been observed throughout the construction of tunnels in this material.

With such positive evidence of stresses in the material, what good would it do to wrap a layer of gravel around the ring, even if there were a possibility of ejecting it? This is the key note to the whole question. It is not one as to the fluidity of the material but rather as to the stresses actually set up in the material during tunneling operations. The question of fluidity does not enter into the discussion except that it has been taken up as a secondary consideration to illustrate the greater active pressures existing in a material with a low angle of repose which was determined by General Raymond to be 2° 46′ from exhaustive tests made during the driving of the Pennsylvania tunnels.

There is an error in the statement that the deposition of clay would be dumped in the river bed, as was the case in the 14th Street tunnels. * * * A general rule as to the depth of cover over the top of the shield in driving has been to have the depth of cover one and one-half times the diameter of the shield when the air pressures are balanced at the bottom so that, in order to drive the 42-ft. shield 50 ft. below the surface of the Hudson river, it would require a blanket which, theoretically, would have to extend about 12 ft. above the surface of the water so that, when you get into a discussion of the possibility of dumping clay in order to safe-guard the tunnel heading, you are getting into a realm of conjecture which leads into a discussion with no results. In other words, the proposed diameter of the tunnel so far exceeds practice that you can only draw upon your imagination for what would be needed. * * *

C. M. HOLLAND.

Chief Engineer New York State Bridge and Tunnel Commission and New Jorsey Interstate Bridge and Tunnel Commission.

Editor, Public Works, Sir:—Referring to your articles on Tunneling in Silt and the editorial on Subaqueous Excavation for Hudson River Tunnels, I wish to make the following statement:

The facts that you have to keep in mind are that the original riverbed of the Hudson, where undisturbed, is a dry, firm, tenacious clay. That wherever the top of this original riverbed is at a depth too low to properly cover a tunnel, that heavy clay blankets deposited a sufficient time in advance over such soft places will displace the soft material and give the same kind of clay to a safe distance over the tunnel. So that it is simply a question of properly blanketing the tunnel line to enable a shield tunnel to be driven with great facility and safety, as has been done in the case of all the East River tunnels that were recently constructed.

It was in connection with driving these last tunnels that the method of clay blanketing the tunnel long in advance of the work underneath was first done. Before that, the clay blankets were usually dumped after their necessity was discovered in the

tunneling operations. So that there is no longer any reason to fear soft ground along the tunnel line since its presence can be detected and soft ground displaced with heavy blankets long before the shield reaches the parts of the tunnel line so treated.

The great feature of the Haskin tunnel work was the fact of never encountering any water in the clay and that it stood up with very light plates sheathing the excavation for the top and sides, while the bottom was sufficiently hard to hold and have the brick work laid direct upon the clay.

I am using the word clay advisedly. While all clay is silt, the term silt has been used in connection with the material in a viscous state. There is nothing whatever viscous about the Hudson clay, except where the riverbed has been disturbed, and by adhering to the use of the word clay for this undisturbed ground the misunderstandings that arise are avoided.

The idea of not being able to use gravel in this clay is simply an opinion which has nothing to sustain it. The gravel can be used and the tunnels held as erected by its use, the same as would be the case in sand which is much more likely to shift before the gravel is blown into place than the clay is. It is my positive opinion that there is no reason whatever to fear that the clay will close in on the tunnel before the gravel can be blown. As a matter of fact it took more than a year to have this happen in connection with the Pennsylvania tunnels.

Very truly yours,
JOHN F. O'ROURKE.

Sanitary Engineer and Bacteriologist Wanted

The chief engineer of the New York State Department of Health, Theodore Horton, asks us to give publicity to the fact that the department wants an assistant sanitary engineer in the Sanitary Engineering Division, at a salary of $2,600 to $3,000 per annum. The State Civil Service Commission will hold an examination for the position on May 15. It is open to both residents and non-residents of the state.

Candidates must be graduates in courses of civil or sanitary engineering of a college or technical school of recognized standing and must have had in addition since graduation at least five years of satisfactory experience in sanitary engineering of which one year must have been in the construction of water supply or sewerage works. The position requires a knowledge of the design, construction and supervision of systems of sewerage and sewage disposal, and of systems of water supply and water purification; the principles of chemistry and bacteriology as applied to the sanitary quality of public water supplies and the principles governing stream pollution and its prevention; the principles of design and testing of plumbing and of the methods of refuse disposal. Subjects of examination: Written examination, relative weight 6; experience, education and personal qualifications, relative weight 4.

At the same time there will be an examination for assistant bacteriologist for the department, salary $2,000 to $2,500; age limits 25 to 45 years; open to residents and non-residents, citizens and non-citizens. Also for a sanitary supervisor at $3,500, a senior statistician, at $1,500, and an epidemiologist at $3,500 to $4,000.

Municipal Safety

The National Safety Council, Chicago, has just issued a bulletin giving a summary of accident records of 14 cities in the United States for the year 1919. In New York there was a total of 4,173 killed, including 1,128 in highway accidents, 976 by falls and 188 by miscellaneous accidents; in Chicago 420 automobile and 235 industrial accidents; in Cleveland, 136 automobile and 254 industrial; in St. Louis, 97 automobile and 42 industrial, in Baltimore, 584 total accidents; in Rochester, 23 automobile, 15 industrial, 105 total; California, 67 automobile, 307 total; Omaha, 24 automobile, 11 industrial; Bridgeport, 36 automobile, 9 industrial, 100 total; New Orleans, 29 automobile, 28 industrial; Milwaukee, 81 automobile, 318 total; Spokane, 6 automobile, 35 total; Springfield, Ill., 12 automobile, 49 industrial, 159 total; Evansville, Ind., 8 automobile, 9 industrial.

Dr. R. S. Vitt, coroner of St. Louis, reports that in 1919, with a population of 922,000, St. Louis had fewer coroner's inquests than in 1901 when its population was only 604,000 and that industrial fatalities were reduced from 110 in 1917 to 42 in 1919. A comparative chart of coroners inquests reveals the fact that inquests in St. Louis jumped from 1,200 in 1905 to 2,000 in 1917 and that in the next two years they dropped to 1,400 as a direct result, the coroner says, of the safety campaign inaugurated at St. Louis during the 1918 Safety Congress and continued since then by the St. Louis local of the National Safety Council.

St. Louis, therefore, lays the formal claim to the title of the safest city in America and ten other cities, while not definitely questioning her right to it, are endeavoring to beat the St. Louis record. These cities are Cleveland, Cincinnati, Pittsburgh, Kansas City, Wilmington, Del., New York, Minneapolis, Buffalo, Portland, Ore., and Rochester, in each of which the local council of the National Safety Council is now conducing a permanent public and industrial safety campaign. In a score of other cities, principally Detroit, Boston, Grand Rapids, Mich., Harrisburgh, Pa., Milwaukee, St. Louis, St. Paul, Duluth, Toledo and Syracuse, N. Y., definite plans are under way for the establishment of similar local safety councils with a full time paid secretary.

An Engineer Decorated

The French order of the "Merite Agricole" has just been bestowed on Major E. A. Kingsley, recently casual officer in the S. O. S. and superintendent of roads from the Mediterranean Coast north to Paris and from the advance section west to the base ports. Major Kingsley was for seven years chief engineer of Little Rock, for two years engineer for Pulaski County and later first state highway engineer of Arkansas.

Municipal Asphalt Paving Plants

Since publishing the list of municipal asphalt paving plants in our issue of April 17, we have received from Mr. Mullen the name of Guayaquil, Ecuador, and also the plant in the Bureau of the Bronx, New York City, which was unintentially omitted from the list.

PUBLIC WORKS.

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A. PRESCOTT FOLWELL, *Editor*
FRANK W. SKINNER, *Associate Editor*

Should Engineers Prepare Contracts?

It has for years been the practice for engineers, both regularly employed officials and consulting engineers, to prepare the specifications for work upon which bids are to be invited and to attach to these a form of contract to be signed by the successful bidder. This form is generally copied from others which presumably, having served for numerous former contracts, is legally correct. The question was raised recently whether it is compulsory that every contract be drawn up by a lawyer, and was decided in the negative, as told elsewhere in this issue.

But while an engineer *may* prepare the form of contract, it would seem to us advisable that both this and the specifications be passed upon by a local lawyer. In the case of a city, this should be the city's counsel; while most companies retain a lawyer for such purposes. This submission to a lawyer is no reflection upon the engineer, who is not supposed to be a legal expert; and the safeguarding of the interests of his client involves the assurance that the form in question meets all requirements of local laws and ordinances. To mention only one point, the several states have different laws relative to mechanics' liens, and the same contract might not be consistent with all of them.

Subaqueous Excavation for Hudson River Tunnels

Before the pneumatic shield method of driving subaqueous tunnels had reached its present perfection, the driving of tunnels, especially those of large diameter, through mud and silt a short distance below the river bottom was considered very difficult and hazardous and on one occasion great loss of life occurred in the first attempts to tunnel the Hudson river from the lower part of New York City to New Jersey.

This work was done by The Hudson Tunnel Railway Company, organized by the promoter of the enterprise, Col. D. C. Haskin, who held a patent for tunneling under compressed air, and who at first assumed that practically no other support to the excavation would be required than that afforded by the air pressure. The method of tunneling, using light steel segmental roof plates, reinforced on all four sides by light angles, through which they were bolted together, was finally evolved, and this method is successfully used today in driving subaqueous and other tunnels of diameters up to twelve or fourteen feet. Notable examples of this, in this locality, are to be found in the work of the Passaic Valley Sewer Commission, including the big outlet sewer under New York Bay, now under construction.

This original Hudson tunnel was finally completed by the shield method, substituting cast iron in place of the brickwork previously used, under the recommendations of Sir Benjamin Baker, who advised the English investors in this financially defunct enterprise.

A little farther upstream, tunnels were driven by the same shield method for the Pennsylvania Railroad Company, all of them encountering substantially the same soil conditions.

At first, much was said regarding the dangers and unstable character of the soil penetrated, which has often been represented as semi-fluid and treacherous, very dangerous to encounter and so weak and unreliable that it would be unable to properly support tunnels even though they were driven through it. Such statements have direct bearing on the vehicular tunnel from New York to New Jersey which will soon be commenced. Some engineers claim that the conditions are such as to make it almost impossible to construct it safely and successfully, especially if the diameter is the maximum that has been proposed, much exceeding any precedent under similar conditions. Other engineers believe that the execution of the work with improved methods now available will not be unusually difficult, and that a reliable structure can be built safely with rapidity and economy.

One of the chief objections to the largest diameter proposed is the assumed difficulty of maintaining the face of the excavation and of preserving the required air pressure, which it is asserted cannot be easily differentiated at different elevations and if high enough to be adequate at the invert of the tunnel will be too high at the crown, causing blow outs there. These objections are especially directed to the approaches to the subaqueous tunnel, which it is expected will pass through sand and gravel.

The validity of these objections depends largely on the accuracy of the premises on which they are founded, so that any reliable information concerning the character and behavior of the soil to be encountered is of great value.

During the construction of the McAdoo and Pennsylvania Railroad tunnels, few visitors were admitted to the shields and little information was permitted to be given out concerning the details of the work and the conditions encountered. We are therefore fortunate in being able to present on page 369 of this issue reliable, specific information on the important characteristics of the silt and its treatment and behavior under practical conditions, prepared from the authoritative statements of one of the responsible experienced men employed on the work. These data, although now several years old, have never before been published and throw important light on the subject.

From them it appears that, so far as noted, the same conditions and characteristics prevail all along the bottom of the Hudson river in the vicinity of the proposed vehicular tunnel, and that the silt, at a reasonable depth below the bottom of the river, is a uniform, homogeneous, dense mass, tough and firm, which can readily and safely be excavated and which has sufficient strength to stand up well without support in vertical and steeply inclined faces. It also has tightness and strength to retain air pressure and, with proper treatment and appliances, can be tunneled more easily and safely than some other materials. It is to be inferred that where its mass, weight or consistency is inadequate for the shield method, it can be positively supplemented by an artificial blanket of clay dumped through the water and increasing the tunnel roof to the required thickness, the clay being afterwards dredged out if necessary.

The material has a certain degree of plasticity, enabling it to be penetrated by impact or pressure, as in pile driving, but is practically impervious and has sufficient tenacity to maintain a firm surface when kept under natural conditions. The upper part of the stratum close to the bottom of the river is of course much softer and more unstable than at greater depths where it is under heavier pressure.

Very dense, impervious clay of a somewhat similar nature was successfully tunneled under Boston Harbor with the aid of a roof shield only. This clay stood up well in vertical faces without bracing, but after a short exposure to the atmosphere it swelled so much as to produce tremendous pressure on the roof and side sheeting, often crushing the ends of the heavy timbers into the 12 x 12-inch sills.

One of the best known and important examples of subaqueous tunneling through river bed clay is that of the Thames tunnels, London, where the sedimentary material encountered closely resembles that under the Hudson river and behaves in a similar manner when excavated. Tunnels were successfully driven through it under atmospheric pressure, and without difficulty, many years before the Hudson river tunnels were commenced, and the material they penetrated has justly been considered as ideal for tunnel excavation.

Street Cleaning in Philadelphia to Be Reformed?

Those who have been watching for years to see Philadelphia abolish its old graft-burdened methods of collecting and disposing its refuse and of cleaning its streets have almost been forced to the conclusion that that desirable end would never be attained, or that, if temporarily attained, the grafters who have so long been bleeding the treasury through the Public Works Department would soon find means for returning to power and abolishing the more economic and efficient methods. Such well-wishers have been encouraged recently by the report of a committee of the City Council, which unanimously endorsed the administration ordinance to authorize the director of public works to make a study into the advisability of having the streets cleaned, and garbage, ashes and rubbish collected, by city forces. While this recommendation is for an investigation only, and it is possible, of course, for such investigation to condemn the project and thus furnish ammunition against the reform, we hope that public opinion, which is so difficult to arouse in behalf of the public in Philadelphia, will prevent any such outcome.

It may be said that the performing of such services by contract is not necessarily objectionable from the citizens' and taxpayers' point of view, but in this particular case the awarding of contracts for these purposes has become one of the greatest municipal disgraces to be found in the country. Each of these services requires an enormous equipment for a city as large as Philadelphia, while the disposing of the garbage requires a very expensive plant, which, if not used for this purpose, is of practically no value for sale or other use; and yet it had become the practice to delay advertising these contracts until a very few weeks before the letting (sometimes only two or three), and to let contracts for only one or possibly two years at a time, thus making it impracticable for any bidder to offer reasonable terms except those who were already doing the work and accordingly had the necessary equipment, or else those who felt satisfied that their pull with the powers in control would be sufficient in the future to guarantee their obtaining the contract for several years to come. No contractor could safely make a contract for one year, with no guarantee that he would be able to renew the contract for the succeeding year or years, without including in his price a sufficient amount to entirely reimburse himself for the cost of the equipment. This was one of the most outstanding features which condemned the Philadelphia system of awarding these contracts, but the politicians in control had numerous other methods of rewarding favorites, punishing those who rebelled against their control, and entirely eliminating from the competition those whom they did not favor.

It is true that, with the work done by city forces, opportunities for graft are by no means eliminated; but at least the contemptible politicians who have acquired millions through their control of these public services, although themselves holding no position in the government, will be required to reveal themselves, or the grafting methods can be traced more directly to the officials personally responsible for them, who can be gotten at directly by the votes of the public if not by the law.

Without being over-sanguine, we hope that this may be the beginning of a movement for the improvement of public service conditions in Philadelphia which will end in the public's finally casting off the strangling embrace of the two or three "old men of the sea" whom they have for years been carrying as unofficial recipients of a large share of their taxes.

Jamaica Bay Channel

The project for a 30-foot channel in Jamaica Bay, New York City, has reached a stage where only a strong public expression in its favor can save it, according to Senator Calder. With this in view, a meeting of representatives of commer-

cial interests of the city was called March 31 by Commissioner Murray Hulbert. The Committee on Rivers and Harbors opposes the project on the ground that it is a new one. It also wants a promise that the Board of Estimate of New York will properly improve the land approaches. It is understood that $7,500,000 has been appropriated for this purpose contingent on immediate action on the part of the Federal Government.

Labor Notes

Some recent happenings and reports which have a bearing upon the subject of the labor supply available in the United States.

Because the strike violates a recent arbitration award, Denver building trades contractors have brought an injunction suit against three building trades unions which struck April 1.

The "outlaw" railroad strike which has collapsed after inflicting many millions of dollars damage on the public, was deliberately planned by radicals, I. W. W.'s and Bolshevicks, to cause the greatest possible injury to property and business. Ostensibly it arose from demands submitted by Chicago Yardmen's Association for increased pay per hour for conductors from present rate of 66 2/3 cents to $1; for switchmen from 62½ cents to 95 cents; for switch tenders, from 50 cents an hour to $5 per day.

The American Federation of Labor tried to maintain a safe position by the announcement of Samuel Gompers that it would try to help end the strike but that the men's grievances were real and must be adjusted.

Louis Marshall stated at a recent meeting of the National Conference on Immigration that "there is a shortage of labor to the extent of at least 5,000,000 men."

A free clearing house service has been established by the Baltimore Employment Managers' Association. Descriptive lists of workers in excess of demand will be furnished daily.

Shortage of Labor Serious at Marion, Ind.

In a recent letter to Public Works, T. E. Petrie, president of the Board of Public Works and Public Safety of Marion, Ind., says: I am sorry to state that this city has practically been on a standstill as far as new improvements are concerned for the last two years, owing to the high cost of material and labor as well as the shortage of common labor.

There were but four contracts let last year, 1919: one concrete alley, containing 427 square yards, and three sewers and two of the sewer contracts are not completed and have been carried over and will be completed this year. It has been practically impossible for the contractors to get help and they refused to bid on several sewer jobs that were up for letting. The city has been short of help for two seasons in the street cleaning department, also we have been short of help in our municipal water works plant and have, in order to keep the force, raised their wages at two different times. Common labor received 35c. per hour in the spring of 1919 and in the fall was from 45c. to 50c. per hour. I do not expect much street or sewer work in this city this year, owing to the high prices of material and labor.

Advanced Immigration Policy Recommended.

The National Conference on Immigration under auspices of Inter-Racial Council recommends the establishment of a Federal board of assimilation, to co-ordinate governmental activities relating to immigration, facilitate distribution of immigrants, supply them with information in securing employment, afford them instruction, and protect them against fraud and exploitation. It proposes modification of present exclusion laws by elimination of literacy test; advocating more extensive use of U. S. Consuls for advice.

Resolutions were passed urging that naturalization be permitted without exacting a compulsory preliminary declaration of intention and allowing for transfer of proceedings for naturalization from one district to another and for repeal of requirement of one year's continuous residence in State in which application is filed; that new laws be enacted to protect savings of immigrants; and favoring the establishment of bank departments affording special facilities for immigrant accommodation.

French Strike and Arbitration Laws.

The proposed French law to settle industrial disputes declares that, while right to strike is in no way denied, every possible effort to settle disputes by agreement must be made before work is stopped; in case of a dispute, employes affected must select delegation from their number, consisting of employes over twenty-one who have been at least six months in firm's employ, to meet with representatives of employers; in case of failure to agree, matter must be referred to arbitrator appointed by mutual agreement, or each side may name an arbitrator, or application may be made for arbitrator nominated by permanent conciliation committee of the trade concerned, or by the local *jude de paix*. In case of disputes connected with railways and other vital industries, conciliation committees must include representatives of the public to be appointed by Government. In case of failure to agree at preliminary meeting, a minute setting forth exact facts must be drawn and signed by both sides. Arbitration is made compulsory in public services.

The creation of a permanent national employment service to cooperate with states and municipalities is under consideration by the U. S. Secretary of Labor, who has requested the governors of all states to send representatives to a conference in Washington, April 23, 24 and 25.

Sewage Sprinkler Nozzles

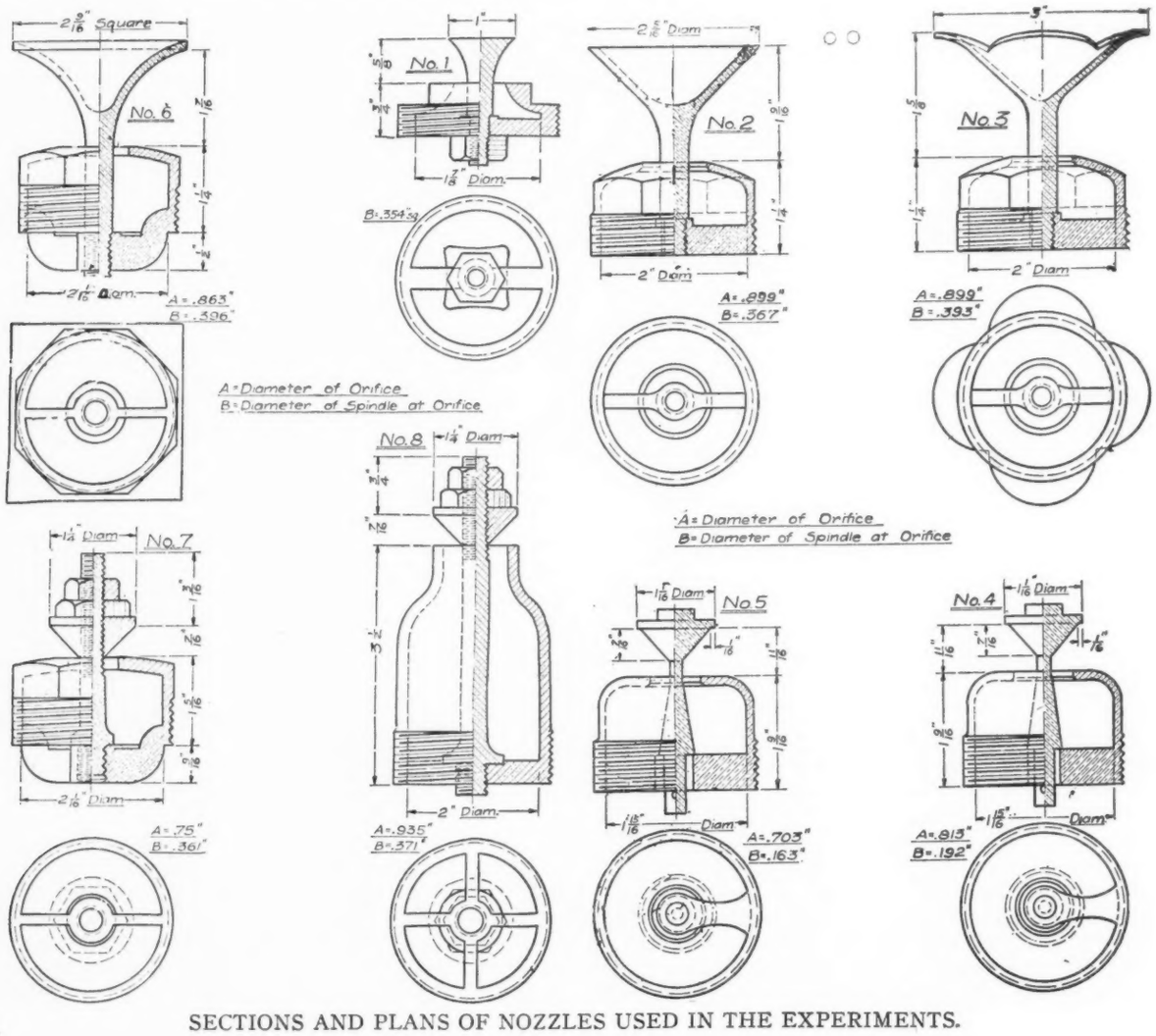
Coefficients of discharge of eight different kinds of nozzles were determined by experiments conducted at the hydraulic laboratory of Perdue University. In general, the coefficient for any one nozzle was found constant for heads exceeding 1.5 feet.

A series of experiments was conducted in the hydraulic laboratory of Purdue University by Professor T. W. Grove and W. E. Stanley, Instructor in Hyradulics, and C. E. Logan, civil engineer student in the university, the object of which was to determine the coefficients of discharge of several types of sewage sprinkler nozzles and obtain information necessary for selecting the best design of nozzles.

It was realized that a thorough investigation of the discharge from sewage sprinkler nozzles would necessarily include a study of the distribution of the discharge as well as the coefficient of the discharge. Because of abnormal conditions created by the war, however, it was decided to limit these experiments to a determination of the coefficients. (It is planned to conduct a series of tests on the distribution of flow later on.) Several experiments have been conducted in the past on the distribution of the discharge, among them those conducted at Rochester, Waterbury and the Massachusetts Institute of Technology.

Eight nozzles were experimented with, these being the following:

No. 1 Chase square nozzle,
No. 2 Taylor round nozzle,



SECTIONS AND PLANS OF NOZZLES USED IN THE EXPERIMENTS.

No. 3 Taylor square nozzle,
No. 4 Worcester round nozzle, 13/16" orifice,
No. 5 Worcester round nozzle, 11/16" orifice,
No. 6 Merrit square nozzle,
No. 7 Priestman-Beddoes round nozzle,
No. 8 Weand Atlantic type round nozzle.

No. 1 was given to the university by Mr. Chase, assistant engineer of the New York State Board of Health; Nos. 2 and 3 by the Pacific Flush Tank Company; Nos. 4 and 5 by Mr. Gault, superintendent of sewers of Worcester, and Nos. 6, 7 and 8 by A. Priestman of Philadelphia.

The accompanying illustration shows each of these in plan and section. Table No. 1 gives dimensions and areas of discharge openings in these several nozzles. (The base of the nozzle is the large end through which the water enters. The orifice is the opening in the smaller or discharge end. The spindle is the rod which supports the cone for affording proper distribution of the discharged water. In the first six nozzles the spindle and the cone are in one piece; while in the other two the cone works along a threaded spindle and may be set in any desired position.) The area of the orifice minus the cross-sectional area of the spindle is the net area of discharge.

TABLE 1.—DIMENSIONS OF DISCHARGE OPENINGS.

	Nozzle orifice		Spindle		Net area of discharge	
Nozzle No.	Diameter inches	Area square inches	Diameter inches	Area square inches	Square inches	Square feet
1	....	.6000	.354	.0984	.5016	.00322
2	.899	.6348	.367	.1058	.5290	.00367
3	.899	.6348	.393	.1213	.5135	.00357
4	.813	.5191	.192	.0290	.4901	.00340
5	.703	.3882	.163	.0209	.3673	.00255
6	.863	.5849	.396	.1232	.4617	.00321
7	.750	.4418	.361	.1024	.3394	.00236
8	.935	.6866	.371	.1081	.5785	.00402
†7a	.750	.4418	.584	.2679	.1739	.00121
*8a	.935	.6866	.596	.2790	.4076	.00283

†Applies also to 7b and 7c. *Applies also to 8b and 8c.

APPARATUS EMPLOYED.

A wooden box 4 feet square by 3 feet 6 inches high was suspended from the ceiling. A 4-inch pipe 8 feet long passed through the bottom of this box, and through this was forced the water which was used in the experiments, which water was furnished by a centrifugal pump. At the top of this pipe was a 4-inch to 3-inch reducer, followed by a 3-inch to 2-inch reducer, and the nozzles were screwed into the last named. A quarter-inch pipe was tapped into the 4-inch pipe at a point just below the large reducer and was connected to a glass tube mounted alongside the tank, which served as a piezometer. By means of a tape mounted behind the piezometer, the elevation of the water column could be read directly to thousandths of a foot with the aid of an index pointer and attached vernier. Water sprayed from the nozzle fell into the wooden box and was led from this by a drain pipe into a weighing tank set on a platform scales immediately below.

The elevation of the water column in the piezometer above the base of the nozzle was taken as the total head acting on the nozzle. The velocity of approach was negligible, being equal to 1.007 feet per second for the maximum flow of 0.0879 cubic feet per second. The corresponding velocity head was only 0.0157, while the pressure head was 10.97 feet.

MAKING THE TESTS.

Each nozzle was tested under heads ranging from one to eleven feet, the flow being regulated by a valve in the pipe bringing the water to the apparatus. Five readings were taken for each run, and the average of these used. In addition, there were recorded time, initial and final weights of water, and temperature of water. As the last remained practically constant, it was not considered in the computations.

The calculations were made on the theory that the quantity discharged is equal to a coeffcient times a $\sqrt{2gh}$, and a, h and q being ascertained, the coefficient C was calculated. It was found that, using the equation $q = m\ (h)^n$, the values of m and n were constant for any one of the first seven nozzles.

In testing nozzles 7 and 8, the position of the cone was varied, four positions being used, namely, the bottom of the cone placed ⅛ inch below the top of the orifice, on a level with the orifice, 1/16 inch above the orifice and ⅛ inch above. The rate of discharge, of course, increased as the cone was raised. For instance, with a head of 11 feet on Nozzle No. 7, the discharge in galions per minute was about 8.8 for ⅛ inch below, 16 for the same level, 16.4 for 1/16 inch above, and 16.7 for ⅛ inch above.

CONCLUSIONS.

The conclusions drawn from the experiments are set forth in the report (which is published as Bulletin No. 3 of the Engineering Experiment Station of Purdue University) as follows:

The relation of the logarithms of head and discharge can be represented by a straight line for all nozzles tested, with the exception of Nozzle No. 8.

It is essential that care be taken in fixing the position of the cone in adjustable nozzles. Lowering the bottom of the cone below the level of the orifice has a more serious effect upon the rate of discharge than does the raising of the cone above the same level. This is brought about by the fact that the net area of the discharge opening is decreased as the cone is lowered.

The coefficient of discharge remains constant for all nozzles except No. 8, when the head is greater than 1.5 feet.

The rate of discharge for nozzle No. 6 may be increased by reaming the inner edge of the orifice.

The report contains eighteen tables, giving the various figures obtained by the test. One of these tables gives the dimensions of the discharge openings, the second gives the determination of piezometer readings for zero head, while one table is devoted to the results obtained for each nozzle, including a table for each of the four positions of Nos. 7 and 8. Table No. 18 gives the values of the coefficients of discharge for each of the nozzles except Nozzle 8. This coefficient C was as follows:

For Nozzle No. 1, 0.648; for No. 2, 0.756; for No. 3, 0.696; for No. 4, 0.666; for No. 5, 0.675; for No. 6, 0.598; for No. 6, after it had been reamed out on the inside of the orifice, 0.668; for No. 7, in the four positions indicated, 0.569, 0.599, 0.586 and 0.591, respectively.

As an illustration of the data tabulated for the several nozzles, we give herewith that for the Worcester round nozzle, No. 4.

CALIBRATION OF WORCESTER ROUND NOZZLE, 13/16-INCH ORIFICE.

Gage correction = 0.515 feet. Temperature of water = 73° F.

Run	Time seconds	Discharge Pounds	Discharge CFS.	Discharge GPM.	Head Obs. feet	Head Cor. feet	C.
39	180	178	.0159	7.14	1.341	.826	.643
40	150	211	.0226	10.1	2.082	1.567	.663
41	150	269	.0288	12.9	3.068	2.553	.662
42	149.6	322	.0345	15.5	4.155	3.640	.663
43	150	356.5	.0381	17.1	4.951	4.436	.664
44	150.2	394.5	.0421	18.9	5.88	5.37	.667
45	149.4	435	.0467	21.0	7.08	6.57	.669
46	150.2	457.5	.0488	21.9	7.73	7.22	.666
47	150.6	498.5	.0531	23.8	9.01	8.49	.668
48	150	528	.0564	25.3	10.05	9.53	.670
49	150.6	570	.0607	27.2	11.57	11.05	.670
50	150.6	130	.0138	6.20	1.143	.628	.639

National Highway Policy

Points to be placed by the Federal Highway Council before the platform builders of the dominant political parties for favorable action at their respective conventions.

It has been and is the policy of the Federal Highway Council to advocate a national system of highways to be built and maintained at the expense of the Federal Government, under the supervision of a Federal Highway Commission, and to extend and continue Federal Aid after 1921, thereby encouraging and assisting the states to connect up their state systems with the nation system, making both more effective, and to issue such literature as may be helpful to the counties in solving their road problems.

The Federal Highway Council believes that it is the duty of the Government to take over about 60,000 miles of the main highways to construct and rebuild, where necessary, as a national system, the States to take over 240,000 miles as a main state system, and the counties to take over about 300,000 miles of market county roads, making a system of about 600,000 miles, of which between 200,000 and 250,000 miles have been improved, and leaving between 300,000 and 350,000 miles to be improved.

DEVELOPMENT OF STATE HIGHWAY DEPARTMENTS.

The highway problem, during the last century, has grown so extensively that the communities under whose supervision it came could not satisfy its needs, and it was necessary for each county to try and supply the want that the community failed to satisfy. As the country developed and traffic increased, the country could not cover the broad need, and therefore state aid was extended to the county by the state. But this in turn did not satisfy traffic demands. It was not a great while before the state realized that a more powerful unit should step in and take over a certain number of miles of road and build a state system, so State Highway Departments were formed. The need was met as far as the state conditions were concerned, but due to the great increase of traffic brought about by the advent of the motor vehicle, the Government realized that to properly take care and develop interstate traffic on the highways, it would be necessary for the Government to co-operate with the states by appropriating money to assist them in their road building program. Congress passed an act appropriating a large sum to assist the states in building their main roads and to properly establish an efficient State Highway Department.

FEDERAL AID.

Federal Aid has been a great stimulant to the road building program of the country, and whereas up to the present time there has been only a limited amount of road building completed, yet a great good has been brought about by requiring the establishment of a State Highway Department in each state, and by encouraging the counties to enter on a larger road program.

The Federal Highway Council is of the opinion that Federal Aid should be continued and extended until all the State Highway Departments have been well organized and on a firm, financial and efficient basis, yet it realizes that regardless of how efficient the State Highway Department may be, there still exists a want that it will be impossible for them to satisfy, even with the assistance of Federal Aid, and that want is a national system of highways. A system to be constructed and maintained by the Government under the supervision of a Federal Highway Commission, whose sole duty it will be to devote their energy and time to this work, and administer Federal aid.

STATE COOPERATION.

Officials and others concerned in highway development assert that it is impossible to expect forty-eight states and the District of Columbia operating under forty-nine different units to co-ordinate their plans and systems so that a national system would be constructed in the least possible time, especially when there is no one who has the power or authority to bring these forty-nine different units into accord. Each State Highway Department is independent to act and build the roads that will be of the greatest commercial advantage to its state, regardless of whether such road will be a link in the national system or not. It cannot be expected, they say, of a state highway engineer to devote his time and energy in studying the road conditions of an adjacent state and the states beyond, which would be of great value from a national standpoint. It is his duty to devote his time and energy to conditions in his own state that will be of the greatest value locally but which may not form the main connecting link in the national system.

GOVERNMENT CONTROL.

Therefore, the Council is firmly of the belief that it is the duty of the Government to step in and

establish a national system of highways, create a Federal Highway Commission to take charge of their construction and maintenance, and to administer Federal aid. It also believes that Federal aid should be extended to the states, helping the State Highway Departments to build up their state systems, thereby making the national system more effective and doing the greatest good. Federal aid should by all means be continued until at least this result is accomplished.

Every effort should be made to speedily enact national highway legislation, providing for the construction and maintenance by the Federal Government of a national system of highways, creating a Federal Highway Commission, and in 1921 make an additional appropriation for the continuation of Federal aid.

Federal Public Works Department Referendum

A long step towards the creation of a department of public works headed by a member of the cabinet and providing for the transfer of all kinds of engineering and building construction work from the Department of the Interior and other departments through which it is now so widely scattered, as proposed by the Jones-Reavis Bill, has been made by the Chamber of Commerce of the United States announcing a referendum of the question, as proposed by the National Public Works Department Association.

This action results directly from the petition submitted to the Chamber of Commerce by the Engineering Council representing the American Societies of Civil, Mining, Mechanical and Electrical Engineers and the Metallurgical Engineers and the Society for Testing Materials. The council has studied this question through a committee headed by Chas. Nagel, formerly secretary of Commerce and Labor.

In this action, the Chamber of Commerce is cooperating in a general plan to secure the support of representative commercial and civic organizations for the promotion of economy and efficiency in government business. The plan for a Department of Public Works is vigorously supported by more than 100 engineering societies representing every state and many of the large cities and having a membership of more than 100,000, as well as by the Associated General Contractors' of America and many state and local contractors' organizations. There is yet to be presented any serious objection to the plan and with the very strong and influential efforts in its behalf there now seems to be good reason to hope for the establishment of a National Department of Public Works.

Municipal Street Cleaning in Philadelphia

The committee of city property of the City Council of Philadelphia unanimously voted to refer with favorable recommendation to the finance committee the administration's ordinance to authorize the Director of Public Works to make a study into the advisability of the city doing its own cleaning of streets and collecting of garbage, ashes and rubbish, and to provide $25,000 for that purpose.

Among the suggestions made in the course of the discussion was increasing the number of street cleaning districts to procure greater competition, cleaning from houseline to houseline, and making a practical experiment by taking over one district for a period of one year.

Good Roads Week

More than 100 cities throughout the United States have already arranged to participate in the observance of "Ship by Truck-Good Roads Week" commencing May 17.

A national program has been mapped out and endorsed by the governors of several states and the chief executives of many cities, who will urge consideration of highway improvement and highway transportation plans. Every effort will be made to demonstrate the value of the highways to meet increasing needs for certain and economical transportation for short distances and the development of highways as an integral part of the national transportation system.

An impressive demonstration of high possibilities is planned by the simultaneous operation, from all of the principal cities participating, of motor truck trains starting at a given time on territorial tours and transporting pre-arranged loads from city to city and from the farms to the city markets. Many open-air meetings are planned that will promote both the motor truck service and the coordinated improvement of highways, the development of through lines and feeders, and hard surfacing of roads.

Coordinating Labor and Employers With the Public

In a recent address to the Associated General Contractors of the Pacific Northwest, George C. Mason, Portland, Oregon, strongly advocated the representation of the public in capital and labor negotiations. Such action would greatly increase public confidence and satisfaction and might, he believes, be promoted by a plan recently formulated by the industrial relations committee of the Portland Rotary Club which is universally applicable for both the union and non-union organizations and partakes of a shop committee plan that has been highly developed and is generally successful in England and assists essentially the establishment of frank and fair communications between the employer and the committee of employes. He said: "The price we have to pay for industrial peace and industrial efficiency is that we shall lay aside some of our self-assertive individualism and some of our class consciousness and get rid of our conflict-attitudes and subordinate our pugnacious instincts. If we want democracy, we can have it, and unless much of our talk about democracy is to be open to the charge of insincerity, we must desire some form of industrial democracy, but to get it we must develop a new machinery and acquire a new spirit. The fundamental principle underlying this new spirit must be cooperation, frankness and fair play."

Can Engineers Prepare Contracts in New York?

The New York Court of Appeals recently handed down an opinion which seemed to restrict the drawing of legal documents to persons possessing the right to practice law. This raised question in the minds of some engineers as to whether engineers and architects could continue in New York State to prepare contracts and certain other legal or semi-legal documents as has been their practice hitherto. On request of the American Society of Mechanical Engineers for information on this point, Engineering Council submitted the question to the law firm of Parker & Aaron, which replied as follows:

April 15, 1920.

Alfred D. Flinn, Esq., Secretary,
Engineering Council.

We have your inquiry of March 16 calling our attention to the decision recently rendered by the Court of Appeals, Judge Crane writing the opinion. The decision referred to is that of People vs. Alfani, 227 N. Y., p. 334. In that case there was evidence, as the chief Judge said, "consisting of defendant's sign and repeated acts which permitted the trial court to find that the defendant held himself out to the public as being entitled to and did practice law." Defendant had a sign up advertising himself as a Notary Public and as a person drawing "all legal papers." The evidence showed that he did draw a bill of sale and chattel mortgage and advised as to the necessity of filing the mortgage in the County Clerk's Office and that he charged and received $4.00 therefor. When the client was leaving he inquired of the defendant, "In case I have any trouble of any kind and I need any legal advice, can I come back to you?" to which the defendant replied "Yes."

In People vs. Title Guarantee & Trust Co., 227 N. Y., p. 366, a similar question arose in the prosecution against the Title Guarantee & Trust Company for drawing deeds and similar instruments in connection with their business of insuring titles to real estate, and the court held that such action did not violate the statute. The Court says:

"We know that in cities constantly men engaged in the real estate business and banks have prepared for their customers such instruments without doubt or criticism.

"The legislature when it enacted not only Section 280 of the Penal Law, which we have been considering, but also Section 270 relating to the practice of law by an individual without being admitted and registered, was charged with the same knowledge of prevailing customs and practices with which we are chargeable. Its members knew, oftentimes doubtless by practical and personal observation and experience, that laymen throughout the state were rendering such services as are here involved. Not only by practice and custom but by inherent privilege they had the right to do this unless forbidden by statute, and if the legislature intended to prohibit a widespread practice and establish a new rule it was its duty to say so clearly and unmistakably in the statute relating to the practice of law and rendition of legal services by individuals. It did not say so and in my opinion there is not to be found in that section of the Penal Law any provision against the rendition of such services by an individual. We think the same idea is emphasized as in Section 280 that an individual who is not admitted to practice must not assume the character of an attorney at law. He is forbidden to practice or appear 'as an attorney at law or as an attorney and counselor at law' or to make it a business to practice 'as an attorney at law or an attorney and counselor at law' or to hold himself out to the public as being entitled 'to practice law as aforesaid or in any other manner' or 'to assume to be an attorney or counselor at law.' But there is nothing which can fairly be regarded as indicating an intention to abolish an existing and widespread practice and to prevent a layman as such and without any simulation of or pretense to the character of an attorney from drawing a simple instrument as instructed by his customer and not involving or predicated upon any legal advice then given."

Engineers having special knowledge of the engineering work required and the professional skill enabling them to express it, are not precluded as an incident in the practice of their profession from preparing "contracts for engineering work as has been the common practice for years." By so doing they are not holding themselves out as practicing law and are not practicing law.

Very truly yours,
(Signed) PARKER & AARON.

Bridging the Delaware at Philadelphia

With an ordinance sent to the city council that would ratify the act of the Assembly of last year, providing for the building of a bridge across the Delaware river at Philadelphia and a joint interstate commission to supervise the work, Mayor Moore of Philadelphia submitted three cost estimates prepared by George S. Webster, chief of the Bureau of Surveys. The first, for a bridge 8,500 feet long with a straightway approach, amounted to $37,100,000, $28,960,000 for construction and $8,140,000 for damages. New Jersey's share would be $17,500,000 and Pennsylvania would pay $19,600,000. This estimate is subject to slight modifications because of undetermined factors of location, type of approaches and depth and character of rock at the site of the main piers. A second estimate was $56,270,000, the total cost of construction and damages in connection with a bridge with approaches beginning at Fourth and Spruce streets and Fourth and Vine streets. Of this cost New Jersey would pay $19,590,000 and Pennsylvania $36,680,000. The third estimate, for a bridge with an approach in Philadelphia commencing at Sixth and Market streets, including the cost of widening Market street and the opening of two diagonal streets, amounts to $66,590,000, of which New Jersey would bear $19,590,000 and Pennsylvania $47,000,000.

New Jersey-Manhattan Tunnel

Gen. George R. Dyer, chairman of the New York State Bridge and Tunnel commission, has explained why the Jersey City-Manhattan tunnel will have only two lines of traffic.

According to estimates carefully prepared, the capacity of the tunnel in 1924, the date of its opening, will be almost three times as great as the traffic. The cost of building for three lines of traffic would be nearly double that of two.

Ample plazas and approaches have been provided to allow for an uninterrupted flow of traffic; but these approaches are not able to take care of more than two lines of traffic, so that it would be useless to have three lines. To increase the size of the approaches would be an enormous expense to the state, and the money so expended could better be devoted to the construction of a second series of tunnels at another part of the river.

Well Pumping in Savannah

Wells have been used as source of supply for thirty-five years. As yield diminished, air lift was used. The city is now changing to electric pumping from five wells, figuring a less cost than by steam pumping.

Savannah, Ga., began using well water for its public supply shortly after 1880, and by the end of 1887, fifteen wells had been bored near the river pumping station, where river water had been obtained previously. As these wells failed to furnish sufficient supply, in consequence of which river water was mixed with the well water, a new site was selected about two miles distant, where twelve wells 300 feet apart were carried to a depth of 500 to 600 feet. A 12-inch casing was driven for about 250 feet, where it was embedded in rock. These wells discharged into a brick conduit 6 feet in diameter and constructed twelve to sixteen feet below the surface of the ground, which conduit carried the well water to the pump well. This station was known as the Gwinnet Street pumping station. The equipment here consisted of two Holly-Gaskill engines of 12,000,000 gallons capacity each, which maintained the pressure continuously, there being no standpipe or reservoir. This pumping station has been in continuous use since 1893.

The wells at the Gwinnet Street station were at first self-flowing, but the flow gradually lessened, and an air-lift plant was installed in 1902 consisting of two Ingersoll-Rand air compressors of 1,800 cubic feet capacity per minute. In 1908 a 1,200 cubic feet air compressor was installed at the river station, which was operated only during the day, except when a peak load had to be provided for.

When artesian wells were first driven in Savannah the water rose to from 30 to 35 feet above mean low water, but with continuous draught upon the ground water, the static head dropped at least 20 feet to 25 feet at the river station within three years after they were put in operation. At the Gwinnet Street station the static head of the wells was 12 to 14 feet below mean low water in 1918, although in 1890 the head was approximately 28 feet above mean low water. When the wells were first bored at the Gwinnet Street station, the total flow from the 12 wells was 10,300,000 gallons a day. This diminished to 9,500,000 gallons within two years and in 1897 had been reduced to 5,500,000 gallons. In 1902 flow was about 5,000,000 gallons, but when the air-lift was introduced in that year the capacity was increased to 10,300,000 gallons. In 1915 E. R. Conant found that they were yielding 15,000,000 gallons a day.

More recently the city has begun changing the method of pumping the wells, and expects within a few months to abandon the Gwinnet Street pumping station for regular service, keeping it in reserve with fires banked for fire or other emergencies. In place of the former method of pumping, they are installing electric pumping plants, one being located at each well. The pumps used are those provided by Layne and Bowler Company. These consist of a deep-well pump operated by an electric motor, the latter being at the surface of the ground immediately over the well, while the pump itself is 140 feet below the surface. In the case of most of the wells, the motor is placed a few feet below the surface, in a vault provided for the purpose. These pumps discharge directly into the mains at 65 pounds pressure. They will be installed at five stations distributed throughout the city instead of concentrated at one point. Two such stations have now been operated for fifteen months, one for a shorter period, and the other two will it is expected, be in operation by the end of the year. During the fifteen months that the wells have been in service, there has been an interruption of current of not to exceed fifteen minutes total, according to L. A. East, superintendent of water works.

Electricity is purchased by the city at ¾ of a cent per kw. h., and the experience with operating the two plants shows that this will make the cost of pumping about $12 per million gallons, this covering overhead and all expenses. Pumping by steam at the Gwinnet Street station is now costing $27 per million gallons. The consumption by the city averages 13½ to 14 million gallons per day. In September, 1919, the river station was abandoned. As soon as the other two wells are completed, all the pumping will be done by them, the Gwinnet Street station, as already stated, being reserved for emergency purposes only.

The annual report of Mr. East for the year 1919 shows that one of the electrically operated wells, known as No. 10, was in operation since the early part of June and pumped approximately 1,200,000 gallons in a day of 24 hours. In regular operation, however, it has been operating between 12 and 14 hours a day and pumping about 700,000 gallons. Altogether, during June to December, inclusive, this well pumped 149,800,000 gallons. Well No. 13 began operation in the early part of January and was put in full operation in May. This well was found to yield about 2,000,000 gallons in 24 hours. Well No. 17 began operating on the 17th September, and on the following day pumped 4,000,000 gallons of water. This well is 519 feet deep, the 24-inch casing extending to a depth of 110 feet, from which point a 16-inch casing was carried to water. This water is said to be softer than any artesian water the city had previously obtained. It is expected that the discharge of well No. 17 will be equaled by that of each of the two that are not yet completed.

The municipal dock at Trenton has proved of great value during the recent railway strike by permitting a large quantity of goods to be shipped in and out of the city by way of the river when the railroads were too congested or unreliable for adequate service. The dock has been loaded to capacity and the employes have worked day and night to handle the incoming and outgoing freight.

Recent Legal Decisions

ENFORCEMENT OF LIENS.

(Okl.) In suit by subcontractor to enforce a lien against owner of building, the owner may set off any actual damages sustained by contractor's failure to complete building in time, if they are such as were in contemplation of parties when contract was made, in view of Rev. Laws 1910, § 3864.—J. B. Klein Iron & Foundry Co. v. A. B. Mays & Co., 184 P. 577.

(Cal. App.) In actions to foreclose mechanics' lien, defendants, having failed to answer, and thus to put in issue all material allegations of the complaint, particularly those setting forth the contents of the liens, thus having admitted the truth of the allegations, *held* estoppel to raise the question of variance between the claim of lien and the proof.—Krenwinkel v. Henne, 183 P. 957.

(Okl.) In action against owner to enforce a subcontractor's lien, evidence of owner's payments to contractor, who in turn paid money to the subcontractors, etc., during the 60 days within which they otherwise would have been entitled to file liens, was admissible.—J. B. Klein Iron & Foundry Co. v. A. B. Mays & Co., 184 P. 577.

SUBCONTRACTS.

(La). Where a bond of a municipal subcontractor, although reciting it was made in favor of materialmen, was expressly conditioned "for the * * * performance of said contract and the payment of all subcontractors under said subcontractors," one furnishing material to subcontractors had no right therein, in view of City Code, art 3039, as to strict construction of suretyship obligations.—Carolina Portland Cement Co. v Carey & Boettner, 82 So. 887.

(La.) A contractor to whom a sewerage and water board had awarded a contract was not obliged to exact a bond from subcontractors, and incurred no contractual obligation to parties furnishing material to a subcontractor and no law imposed any obligation upon him in favor of such parties, for Act. No. 134 of 1906, providing that the owner shall require of the contractor a bond for payment of furnishers of materials, etc., does not apply to the case of contract between contractor and subcontractor.—Carolina Portland Cement Co. v. Carey & Boettner, 82 So. 887.

A contractor is in no way to blame for having settled with subcontractors without having made a reservation for the claim of one furnishing material to the subcontractor, where he had no knowledge of the existence of the debt, and such party gave notice of it only some 60 days after completion of the work.—Id.

CONTRACTS FOR PLANS.

(Cal. App.) The board of public works of the city and county of San Francisco was authorized to contract with an architect for the preparation of plans and specifications for a projected school house at the usual rate of compensation for such services in the city without calling for bids and awarding the contract to the lowest bidder.—Miller v. Boyle, 184 P.421.

CONTRACTOR'S RIGHT TO BARRICADE.

DAVIS vs. MELLEN, Utah 182 P. A. C. 920. A contractor who works on a highway for the purpose of improving the street has the right to barricade and obstruct the public travel over the section of the street being improved.

HIGHWAY SUBCONTRACTOR NEED NOT FILE CLAIM WITH COUNTY AUDITOR.

(Ind.App.) A subcontractor for highway improvement may recover on the contractor's bond without filing his claim with the county auditor, pursuant to Burns' Ann. St. 1914, §§ 5901a, 5901b.—U. S. Fidelity & Guaranty Co. of Baltimore, Md., v. State, 125 N. E. 420.

SURETY BONDS COVER ROAD LABOR CLAIM.

(Mich.) Bonds given by defendant casualty company as surety for the assignee of road contracts, in so far as concerned graveling of the roads, *held* to cover a claim for labor on which the person who furnished it recovered against plaintiffs, the original road contractors, assignors to defendant casualty company's principal, on the latter's failure to pay.—Sullivan v. Fidelity & Casualty Co. of New York, 175 N. W. 397.

Where a casualty company, by its bonds given to assignors of road contracts, in effect agreed to make good any default of its principal, the assignee, so far as concerned graveling, in making payment for labor furnished, the fact that the damages on account of its liability in each of the bonds are not shown as separate items in an action by an original contractor personally and as assignee of the other contractor does not relieve the casualty company, in the absence of dispute as to the entire damage sustained by the original contractors through its principal's failure to pay.—Id.

In suit by original road contractors to recover from the surety of their assignee of the contracts, in so far as graveling work was concerned, amounts paid on account of a judgment against them for labor furnished, evidence *held* insufficient to show that the assignee of the contract was overpaid, in violation of the terms and conditions in the surety's bonds, so that the surety was released.—Id.

CITY CANNOT APPROPRIATE CONTRACTORS' PROPERTY.

(Ky.) City, having refused to permit contractors to proceed with street improvement work under void contract, had no right to appropriate piping and tiles, which contractors had intended using in performance of contract and left upon ground of street upon discontinuance of work, since city, having repudiated contract, could not rely thereon for purpose of keeping material which would have gone into improvement.—Staebler & Gregg v. Town of Anchorage, 216 S. W. 348.

NEWS OF THE SOCIETIES

May 4-6.—NATIONAL FIRE PROTECTION ASSOCIATION. Twenty-fourth annual meeting will be held in Insurance Exchange Auditorium, Chicago. Secretary, F. H. Wentworth, 87 Milk street, Boston.

May 10-11.—AMERICAN ASSOCIATION OF ENGINEERS. Sixth Annual Convention, St. Louis, Mo. Secretary, C. E. Drayer, 63 East Adams Street, Chicago.

May 13-14-15.—LEAGUE OF TEXAS MUNICIPALITIES. The eighth annual convention will be held at Dallas, Tex. Secretary-Treasurer, Frank M. Stewart, University of Texas, Austin, Texas.

May 18-21.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual convention, Pasadena, Cal. Acting Secretary, S. A. Sewall, 29 West 39th Street, New York City.

June 21-25.—AMERICAN WATER WORKS ASSOCIATION. Annual meeting, Montreal, Canada. Secretary, John M. Diven, 153 West 71st Street, New York City.

June 22-25.—AMERICAN SOCIETY FOR TESTING MATERIALS; Asbury Park, N. J. Office of secretary, Philadelphia.

June 22. JOINT COMMITTEE ON STANDARD SPECIFICATIONS FOR CONCRETE AND REINFORCED CONCRETE. Next meeting at Asbury Park. Secretary-treasurer, D. A. Abrams, Lewis Institute, Chicago.

Aug. 30-Sept. 3.—AMERICAN PUBLIC HEALTH ASSOCIATION; San Francisco. Office of secretary, Boston.

Oct. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 404 Lincoln Avenue, Valparaiso, Ind.

AMERICAN WATER WORKS ASSOCIATION.

Tentative program of the 40th Annual Convention, Windsor Hotel, Montreal, Canada, June 21-24, 1920.

MONDAY, JUNE 21.

Registration, meetings of committees.

Informal reception, dancing.

TUESDAY, JUNE 22.

Opening of convention at 9 o'clock. Reading of Papers.

The Municipal Water Supply of Montreal, by Thomas W. LeSage.

The Works of the Montreal Water and Power Company, By F. H. Pitcher.

These two papers will give a good idea of the dual water supply of Montreal, part municipal and part private, two unusually interesting water works systems, one of which produces chlorine in its own electrolytic plant.

The Experience of Montreal in the Manufacture of Alum, by James O. Meadows.

The Water Works of the City of Quebec, by Arthur Surveyor.

The cold weather problems in this city, including the maintenance of efficent fire protection service in winter, are extremely difficult and the topography of the city presents many unusual features in the distribution of water.

Water Supply Problems in the Province of Quebec, by T. J. Lafreniere.

The Water Works of St. Johns, New Brunswick, by Frank A. Barbour.

Water Works experiences, by Beekman C. Little.

Economic Features of Pumping Station Operation, by Leonard C. Day.

Difficulties in Building the Louisville Pumping Station, by James B. Wilson.

WEDNESDAY, JUNE 23.

The New Water Supply of Winnipeg, by James H. Fuertes and William G. Chase.

President's Address, by President Carleton E. Davis.

Reports from Sections.

Report of the Association's Representatives on the American Electrolysis Committee.

Report of the Committee on Private Fire Protection Services, Nicholas S. Hill, chairman.

Report of the Committee on Official Standards for Water Analysis, Jack J. Hinman, Jr., chairman.

Report of the Committee on Standard Specifications for Cast Iron Pipe and Specials, Frank A. Barbour, chairman.

Report of the Committee on Cold Weather Troubles, Charles R. Bettes, chairman.

Reports of Officers and Standing Committees.

Nomination of Members of the Nominating Committee.

Selection of Place for Holding the 1921 Convention.

Entertainment, probably a trip through the rapids of the St. Lawrence River.

A smoker for the men and for the ladies a theatre or card party.

THURSDAY, JUNE 24.

Superintendents' Day.

Discussion of the selection, installation, reading and maintenance of Water Meters. All members having experiences in this work, especially anything out of the ordinary are requested to communicate with the Editor,

Mr. John M. Goodell,
106 Loraine Ave., Upper Montclair, N. J.

or to prepare and send to the editor a short practical paper or a discussion to be presented at the convention, or come to the convention prepared to relate some experience.

Chemical and Bacteriological Section.

This Section is preparing a program for a separate meeting Thursday. At this meeting a paper will be read by Colonel George A. Johnson introducing the subject of the quality of water.

A general discussion of the legitimate uses of water, what they are and how to estimate them. There has been much discussion on Water Waste and how to prevent it, but up to the present time little on its Legitimate Use. Some cities have been criticised because of the high per capita consumption without knowledge of the legitimate uses of water in that particular place.

The discussion will embrace private sources of industrial supplies; the nature of the demand for water by different industries, the actual demands of water for domestic consumption by families of different means.

Damage of Deep Wells by Sea Water, by Dr. William P. Mason.

Cost-Plus Contracts in Water Works Construction, by George W. Fuller.

Standard Forms for Contracts, by G. W. Buchholz.

The Trend of Prices, by Leonard Metcalf.

Arrangements are under consideration for trips about the city of Montreal, and for a trip by special boat leaving Montreal Friday evening for the Saguenay River.

The above program will be revised and added to.

Carleton E. Davis, President.

J. M. Diven, Secretary,
153 West 71st St.,
New York, N. Y.

Seventh National Foreign Trade Convention.

The important convention to be held in San Francisco, May 12-15, under the auspices of a National Foreign Trade Council, has published a very comprehensive program of topics to be considered in 12 groups taking up education, geography, finance, advertising and various other subjects, one of the most important of which to construction interests is group third, Transportation and Communication. The officials for this group are:

Chairman, R. M. Calkins, vice-president, Chicago, Milwaukee & St. Paul Ry.; vice-chairman, E. L. Jahncke, president, Jahncke Drydocks Corporation; secretary, J. Hubbert Cullen, Detroit.

The principal addresses announced are:

Export and Import Transportatino, R. M. Calkins, vice-president, Chicago, Milwaukee & St. Paul Ry.;

Port and Terminal Facilities, B. F. Cresson, Jr., New York-New Jersey Port and Harbor Development Commission; Communications, Gordon C. Corbaley, Seattle Chamber of Commerce; Oriental Trade Expansion Dependent Upon Transportation Development of Asia, Paul P. Whitham, Trade Commissioner, Department of Commerce.

Brooklyn Engineers Club.

At a regular meeting, April 29, Howard P. Quick presented a paper, illustrated by lantern slides, on "The Development of the Electric Tramway, Light, Power, Gas and Telephone Public Utilities in the Largest Two and Principal Cities of Brazil—Sao Paulo and Rio de Janeiro—and Their Successful Operation under One Management."

It discussed events leading up to the undertakings, handicaps in Latin-American engineering and pre preliminary investigations. It described at Sao Paulo—City Work—American Standards—Hydro-Electric Developments—Gas and Telephone Services—Reserve Steam Plant; and at Rio de Janeiro—City Improvements and Electric Developments—Old Transit Facilities—Organization and Preparation of New Undertakings—Unification of Tramways—Types of Cars—Hydro-Electric Developments—Terminal and Sub-Stations—Reserve Steam Plants—Underground Distribution—Special Undertakings—New Gas Works and New Telephone System Developments.

American Society of Engineers.

Preparations are being made for a large attendance at the sixth annual convention at the Planters Hotel, St. Louis, May 10 and 11, which it is expected will be addressed by a number of prominent men including: M. O. Leighton, chairman of the national service committee of Engineering Council, who will speak on "Getting Salaries for Public Service Engineers Into Budgets," Frances A. Kellor, vice-chairman of the Inter-Racial Council of New York and a recognized authority on immigration and racial problems, who will speak on "The Manpower Engineer—The Opportunity of Americanism" and Fred Lavis of the American International Corporation of New York who will speak on "Opportunities for the Engineer."

The principal speakers at the banquet on May 11 will be Doctor F. H. Newell, president of the American Association of Engineers and head of the department of civil engineering at the University of Illinois, and L. K. Sherman, president of the United States Housing Corporation.

Following schedules, endorsed by the directors, of salaries for state highway engineers and county highway engineers, there has just been issued a comprehensive national schedule for engineers in public service, including assistants, engineers and officials, from rodmen and chainmen at an annual salary of $1,200 to commissioners of departments at a salary of $15,000. A schedule has been prepared by chairman S. T. Hadden, and a committee of 23 members widely scattered throughout the country all of whom actively participated by correspondence and submitted entirely independent data irrespective of the attitude of other members of the committee. It is expected that the schedule will be adopted at the directors' meeting May 9.

The Nashville Club was organized April 8, Matt M. Bird, secretary.

The students' chapter of the A. A. E. at the university of southern California has petitioned for a charter.

National Association of Railroad Tie Producers.

The first annual convention was held April 22 and 23 at the Hotel Sherman, Chicago. Among the principal papers and addresses were:

Practical reforestation with especial reference to financial return, Mr. Howard Andrews, director; The railroad situation and American industry, Samuel O. Dunn, Railway Age; Production of cross ties on Pacific Coast, E. M. Blake, vice-president; Manufacture of cross ties with portable saw-mills, and its possible influence on future cross tie prices, R. J. Witherell, director; A proposal for a central inspection bureau, Warren C. Nixon, and Demand for hardwood lumber and its effect upon the value of standing timber heretofore used for the manufacture of cross ties, General L. C. Boyle, Washington, D. C.

PERSONALS.

Campbell, G. A., has been appointed member of the Nevada State Department of Highways.

Ellis, J. R., has been made principal assistant engineer to W. L. Winter, civil and hydraulic engineer, Forth Smith, Ark.

Bauma, W. H., has been appointed county highway commissioner and surveyor of Thayer County, Neb.

Christhilf, A. E., has been appointed chief engineer of the Annex Improvement Commission of Baltimore.

Dewey, Edwin P., has been appointed city engineer of Pasadena, Cal.

Mead, Prof. Daniel W., of the University of Wisconsin, has been appointed consulting engineer to the Grand River Drainage District of Livingston County, Missouri, on flood prevention plans prepared by the Morgan Engineering Company, Memphis.

Restall, C. H., has been appointed chief engineer of streets and engineering for the city of Boston.

Hockaday, J. W., has been appointed superintendent of water works at Clebourne, Texas.

Toner, J. A., has been appointed superintendent of public works of Meriden, Conn.

The firm of Ball & Snyder has opened a consulting engineering office in New York City.

Knowles, J. H., formerly chief engineer Western Pacific Railroad, has opened a private engineering office in San Francisco.

Ryckman, J. H., is designing engineer for the Department of Public Works, Chicago.

Heidel, C. S., has been appointed state engineer of Montana.

Hanna, David, has been made superintendent of waterworks, Winsaw, Ontario.

Shepard & Wolf have opened a consulting engineering office for municipal and sanitary work at St. Paul.

Spratt, T. A., has been appointed temporary superintendent of the Ottawa Suburban Road Commission.

Givan, Albert, has been appointed assistant state engineer of California.

Herrold, George H., has been appointed managing director and engineer of the St. Paul City Planning Board.

Newell, J. P., Portland Ore., president of the city planning commission, has resigned to accept an important commission with the Canadian government in preparing engineering data prior to the taking over of the Grand Trunk Railroad,

Goff, Edward E., city engineer of Cranston, R. I., died recently.

Miller, J. L., formerly successively county engineer of Ross county, and later city engineer of Chilicothe, Ohio, died Feb. 14.

Atkinson, Irving M., recently assistant division engineer, California State Highway Commission, died in San Francisco, March 1.

Strack, Thos. P., general contractor in municipal work, died recently in Cincinnati.

New Appliances

The New Drill Steel Sharpener.

A new compressed air operated drill steel sharpener machine known as the I-R No. 50 Sharpener has been developed by the Ingersoll-Rand Company. This sharpener was designed to sharpen and shank cruciform steel up to 2 in. diameter or round, hexagon, octagon, quarter-octagon, auger or spiral steel up to 1⅞ in. diameter. When fitted with special devices, it will forge boltheads, pins, stanchions, etc., nearly 200 different products having been made by it.

The single lever, which controls all of the operations of the machine, is fitted with a safety locking device. The throttle valve is of the balanced

DRILL STEEL SHARPENER OPERATED BY COMPRESSED AIR.

spool type, operates easily and quickly, is positive and instantaneous in its action.

The hammer cylinder is an improved valveless type of hammer drill cylinder. This construction permits the free moving hammer to deliver fast and powerful blows with extreme rapidity.

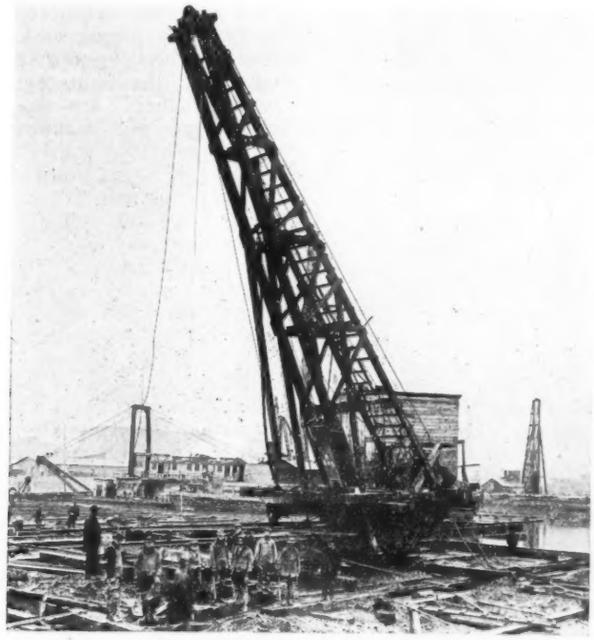
Solvay Graphite Paint.

This paint, manufactured by the Solvay Process Company, is especially recommended by them for bridges, corrugated iron buildings, and other metal structures, because, being made of amorphous graphite, refined pitch and vegetable oils, all of which are absolutely inert and resistent to atmospheric influences, it is a very durable covering for iron and steel. It is a black paint with a covering capacity of 550 square feet per gallon, and requires from 24 to 36 hours for drying.

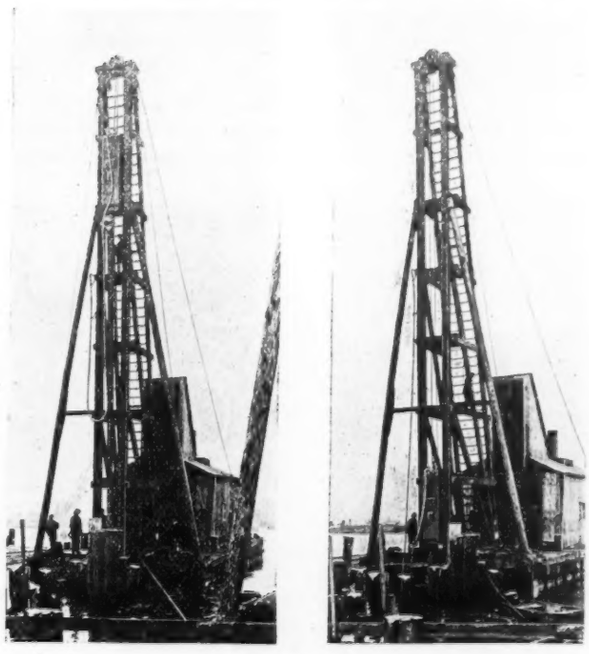
McKiernan-Terry Hammers.

McKiernan-Terry double-acting pile hammers are adapted for both driving and pulling wooden, concrete and steel foundation and sheet piles. They are made in several sizes for all kinds of work and give great efficiency, due to the powerful, rapid strokes that keep the pile in constant motion, reducing its friction to a minimum and preventing the weight of the pile from absorbing the driving force. The 11-B hammer, with 90 pounds steam pressure in cylinder, strikes 120 17,500-foot-pound blows per minute. One of these hammers installed in the tower of an ordinary floating machine drove 58-foot piles in 90 seconds each.

These double-acting hammers are especially useful for driving inclined piles, because the force is substantially independent of the position of the hammer or inclination of the ways, and they can



DOUBLE ACTING HAMMER DRIVING SPUR PILES.



BEFORE AND AFTER DRIVING A PILE 58 FEET IN 90 SECONDS.

easily be handled in tilted ways to drive spur piles that could hardly be installed with an ordinary drop hammer. They are manufactured and distributed by the McKiernan-Terry Drill Company, which also designs and supplies mining and quarrying machinery and lifting jacks. Bulletin 25, sent free on application, describes many difficult jobs successfully executed with these powerful hammers.

Republic Truck Wins as Fire Engine.

On January 13 at 54th St. Pier, New York City, a Republic truck, Model 19, 2½-ton chassis fitted with the Republic standard triple combination fire apparatus, successfully passed the fire truck test of the National Board of Fire Underwriters.

This test is usually held yearly and is so stiff that commercial truck manufacturers have largely passed it up.

The test on January 13 was a special one made at the request of the Republic Motor Truck Company.

The Republic truck actually pumped water continuously for 13½ hours, and at the conclusion of the test the official report says "the motor and pump at the end of the test were quiet, cool, in satisfactory condition, without vibration or pulsations."

The first test was completed in six hours and showed a new pump pressure of 120 pounds and an average motor speed of 1,350 r. p. m.

At the end of nine hours the second test was completed, the net pump pressure being 200 pounds at 1,625 r. p. m.—the pump being geared to the transmission at second speed.

The third test was completed with twelve hours of continuous running and showed a pump pressure of 250 pounds, at pumping capacity of one-third full capacity at 1,250 r. p. m.

For good measure, the pumping was continued an hour and a half after the completion of the tests.

The next day the first truck was given the road test of the board, which is extremely severe. A special course covering twenty miles is laid out, the pavement embracing macadam, asphalt and brick pavements in various conditions.

The Republic, loaded with 1,000 feet of regulation 2½-inch hose and eight men, a regular sized crew, made the trip in 50 minutes and 10 seconds. Further tests in hill climbing and descending were made and in every test the Republic made a perfect score.

United Iron Works, Inc.

This company manufactures machinery for crushing rock and for screening, elevating and storing the product of those machines. The United crushers are made from heavy semi-steel castings and in eight sizes varying from 7x10 inches with a capacity of 6 tons per hour to 12x24 inches with 35 tons capacity. All parts are interchangeable and all machines are provided with a wedged bolt bracket designed to give way first should an unbreakable object get accidentally into the machine.

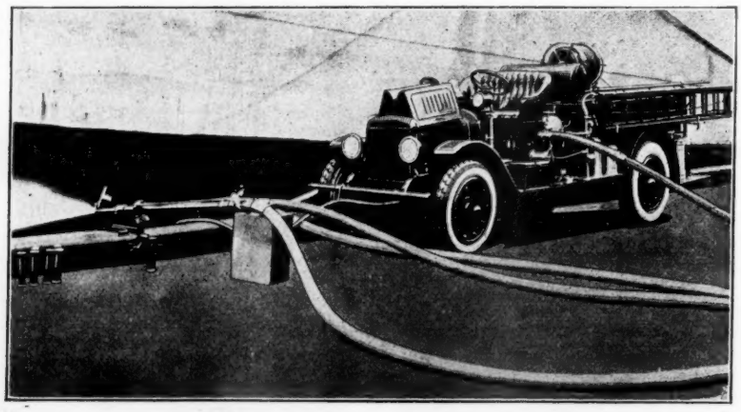
The machines are sold separately or mounted on a special heavy framed steel truck with a gooseneck bearing for the front axle, enabling it to turn within a small radius. The trucks may be equipped with a 14-inch conveyor belt mounted on pulleys 11 feet apart on centers and supported on a two-wheel truck attached to the crusher, thus permitting the stone to be delivered from the crusher at a height of 3½ to 6½ feet above the ground so as to load a wagon alongside, if desired. A folding bucket elevator that can be extended to a length of 17½ feet can be supplied enabling the product to be raised to an elevated storage bin.

Steel and wooden 15 and 30-yard storage bins with W-shape bottoms and three delivery chutes on each side can be furnished, provided with braced supports and with trucks for transportation. They may also be provided with revolving cylinder screens mounted on top. The company also furnishes crushing rollers for ordinary duty and for heavy duty in nine sizes running from 15x10 inches to 42x14 inches.

Crosby Clips.

Crosby clips, manufactured by the American Hoist & Derrick Company, are fasteners for securing wire rope. Each consists of a U-shape bolt with the ends passing through a malleable iron saddle with nuts bearing on the outside. Both parts of the rope being laid parallel and passed through and between the saddle and U-bolt, the latter is screwed tight and develops sufficient friction to prevent the parts of the rope moving on each other and thus secures the bight or splice. One to four clips well adjusted make a quick and reliable fastening that develops the strength of the rope and requires littles or no subsequent attention. It is very suitable for tackles, guy ropes and other purposes.

An unusual example was afforded by the construction of a 180-foot-span suspended-platform, used for taking a 70-ton dragline excavator across the shallow channel of the Rio Grande River for reclamation work. Piles were driven 25 feet apart on opposite sides of the river and between them were stretched ¾-inch steel cables adjusted by tackles and anchored upstream. To these horizontal cables were attached by U-bolts, a floor of transverse 6x16-inch beams 20 feet long and 6 inches apart in the clear. These beams normally floated on the surface of the water and were maintained in approximate position by the cables, secured by the Crosby clips while the dragline excavator crossed the river on them under its own caterpillar traction power. Each end of each main cable was secured by a loop engaging the pile and fastened by three Crosby clips.



AUTOMOBILE TRUCK PUMPS FIRE STREAM 13½ HOURS CONTINUOUSLY, MAINTAINING 250 POUNDS PRESSURE.

The United States Government has recently ordered a $605,000 10-yard dipper dredge from Secor R. Browning, Cleveland.

French Standard Specifications on Various Materials.

Trade commissioner H. W. Adams, of Paris, has transmitted copies of the French standard specifications on various materials, gotten out by the Commission Permanente de Standardization of the Ministry of Commerce. These pamphlets may be examined at the Bureau of Foreign and Domestic Commerce by referring to file No. 21289.